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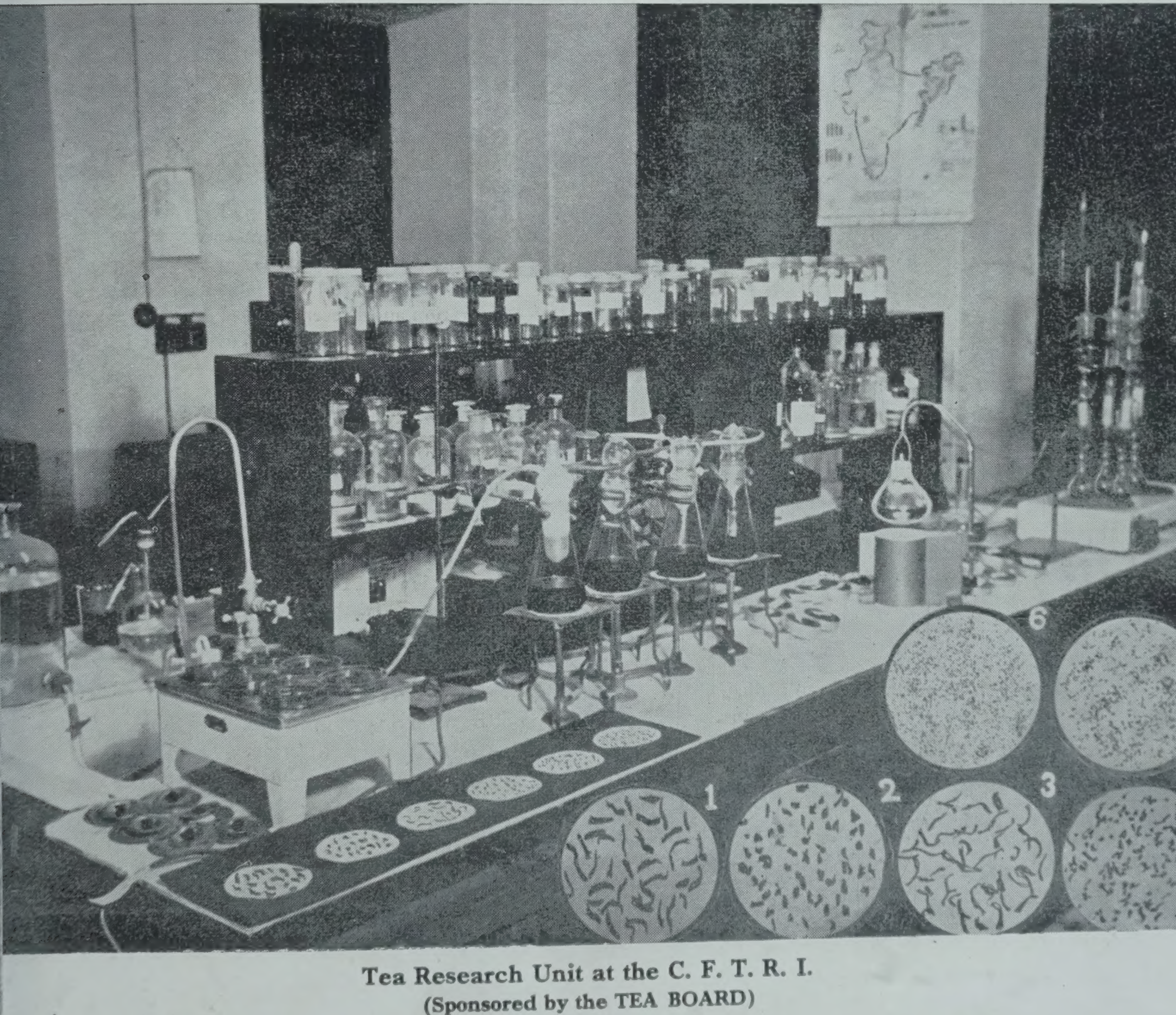

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CHEMICAL COMPOSITION OF ROASTED INDIAN CHICORY

By C. P. Natarajan, C. S. Viraktamath, K. M. Narayanan, N. Gopalakrishna Rao and D. S. Bhatia

(*Central Food Technological Research Institute, Mysore*)

Chicory is admixed with coffee for sale as French Coffee. It is mostly imported from abroad. Attempts have recently been made to grow it in India and it has already been successfully cultivated in Nadiad, Broach and Amalsad[1]. We had recently an occasion to examine some of the samples of Indian Chicory and the results of our study are presented in this paper. The water extract, an important factor of quality in chicory, was found to be low (50.4 per cent) in some samples as compared to the reported values of 70-76 per cent for foreign Chicory[2, 3]. This observation led us to undertake a study on the changes in water extract and colour of chicory as influenced by roasting.

Materials and Methods

(*i*) *Commercial samples:* Samples of roasted chicory powder made from Indian and also imported chicory were obtained from one commercial firm. These powders (-30 mesh) were analysed for moisture, ash, nitrogen and reducing sugars by the standard methods of A.O.A.C. Water extract was determined by Jone's method[4]. The colour of the roasted powder was measured by determining the reflectance in a Photovolt Reflection meter (Model 610), using search unit 610-Y and the three tristimulus filters (amber, green and blue). The tristimulus values X, Y and Z were computed according to the following equation:

$$X=0.8A+0.18B; \quad Y=G; \quad Z=1.18B$$

where A, G and B are the reflectance values obtained by measuring with the amber, green and blue filters respectively. Standard white enamel plaque was used to standardize the instrument. Accurate readings on darker powders were obtained by using a working standard with a reflectance of 15 per cent and setting the instrument so as to read a value 5 times the rated reflectance value. The results are given in Table I.

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(*ii*) *Laboratory samples:* Raw chicory chips obtained from a firm were used for this study. Preliminary trials on roasting chicory in a pan or in the commercial coffee roaster indicated that the roasting is not uniform and the chips tend to char on the edges coming in contact with the heated metal surface. The resulting product was over-roasted and had a low water extract. Different lots of chicory chips were then roasted at controlled temperature in a muffle furnace to ascertain the influence of roasting on the water extract in chicory; the colour was determined as described earlier. Roasting losses were also determined. Samples of roasted chicory were also prepared by roasting in a coffee roaster at controlled temperatures ranging from 180-200° C. The roasting in a coffee roaster was not as uniform as in the muffle furnace or in the oven. The results are given in Table II.

Roasting loss and 'Y' reading in the reflection meter using tristimulus green filter were plotted against per cent water extract (Fig. 1).

Results and Discussions

These studies have indicated that the water extract in chicory is influenced by the extent of

TABLE I. *Composition of commercial roasted chicory samples. (moisture-free basis)*

No.	Samples	Moisture %	Water extract %	Total ash %	Water sol. ash %	Acid insol. ash %	Alkalinity of sol. ash (cc. of N HCl per 100 gm. ash)	Total N %	Crude protein (Total N × 6.25) %	Water soluble nitrogen %	Reducing Sugars %: Before inversion	Reducing Sugars %: After inversion	Colour 'Y'
1	Jamnagar ...	4.42	44.70	9.16	6.35	0.98	20.77	0.73	4.56	0·18	4.56	6.57	2.8
2	Assam ...	2.00	50.40	5.82	3.14	0.86	29.65	0.84	5.28	0.21	7.02	12.75	3.6
3	Munnar ...	2.84	51.13	6.38	3·77	0.24	21.72	0.82	5·14	0.23	8·40	11.60	4.0
4	Coimbatore ...	2.40	65.14	6.71	4.88	0.27	32.33	0.58	3.56	0.30	10.24	18.15	4.2
5	Imported I	3.82	60.20	6.46	4.17	0.76	19.75	1.09	6.84	0.42	13.16	16.45	3.0
6	,, II	9 16	57.00	6.31	3·69	0.60	16·25	1.46	9.11	0.34	11.35	14.90	2.8
7	,, III	10.48	71.43	5.86	3.50	0.52	19.85	0.96	6.03	0.30	16.33	21.50	2.8

TABLE II. *Influence of different methods of roasting on water extract and roasting loss in chicory*

Method of roasting	Temp. °C	Time (mts.)	% Roasting loss	% Water extract	Tristimulus values X	Tristimulus values Y	Tristimulus values Z
Coffee roaster ...	200	18	15.0	74.1	5.1	7.8	0.91
	200	23	25.0	63.3	4.0	6.0	0.83
	190	25	27.0	59.3	2.80	4.8	0.74
	180	20	21.0	71.4	4.3	6.4	0.88
Hot air oven ...	200	15	14·9	70.9	7.8	9.0	1.57
	200	18	15.1	70.0	7.4	8.0	1.49
	200	21	25.0	62.1	2.9	3.6	0.63
	200	22	28.8	59.2	2.50	3.0	0.63
Muffle furnace ...	240	8	11.5	75.9	11 6	14.0	2.36
	240	10	12.0	74.5	9 3	11.4	1.96
	240	12	16·4	69.5	6.7	7.8	1.47
	240	14	26.5	60.4	2.5	3.0	0.7
	220	15	28.5	58.4	2.7	3.2	0.7
	220	17	30.9	49.7	2.2	3.0	0.6
	220	19	32.6	40.0	2.0	3.0	0.6
	220	21	34.8	36.0	2.0	2.8	0.6

Moisture in raw chicory: 8.5%

roasting. Temperatures over 200° C have been reported to cause over-roasting[5]. Taking the moisture in raw chip as 8-10 per cent, if the roasting loss exceeds 15 per cent and 'Y' value is below 7.5, the water extract is reduced below 70 per cent. When the roasting loss was below 20 per cent and the 'Y' value above 5.0, the water extract in chicory ranged between 65 and 70 per cent. On further roasting, there was a progressive decrease in the water extract. The relationship between water extract and roasting loss seems to be linear upto about 30 per cent roasting loss (Fig. 1). The colour of chicory powder giving water extract of 65-70 per cent will be less than the medium roast of coffee.

It has been reported that a small amount of oil is incorporated during the roasting of chicory. We have observed that incorporation of oil (groundnut) makes the roasted powder appear darker (Fig. 2).

It has been experimentally shown that the water extract of chicory varies with the extent of roasting. Chicory is admixed with the coffee powder to increase the water extract and to get a stronger decoction on brewing. Generally, for the purpose of calculating the proportion of chicory in coffee—chicory mixture, the water extract of chicory is taken as 70 per cent and that of coffee as 24 per cent[4]. This procedure will not yield reliable results if chicory with low extract is used for blending with coffee in the preparation of a mixture popularly known as 'French' Coffee. It is therefore suggested that the definition of chicory be amplified to include a minimum limit for water extract.

From the data on chemical composition given in Table I, variations in water extract, total nitrogen and reducing sugars are observed among samples from different regions. Low water extract is possibly due to over-roasting. In order that the water extract of Indian chicory

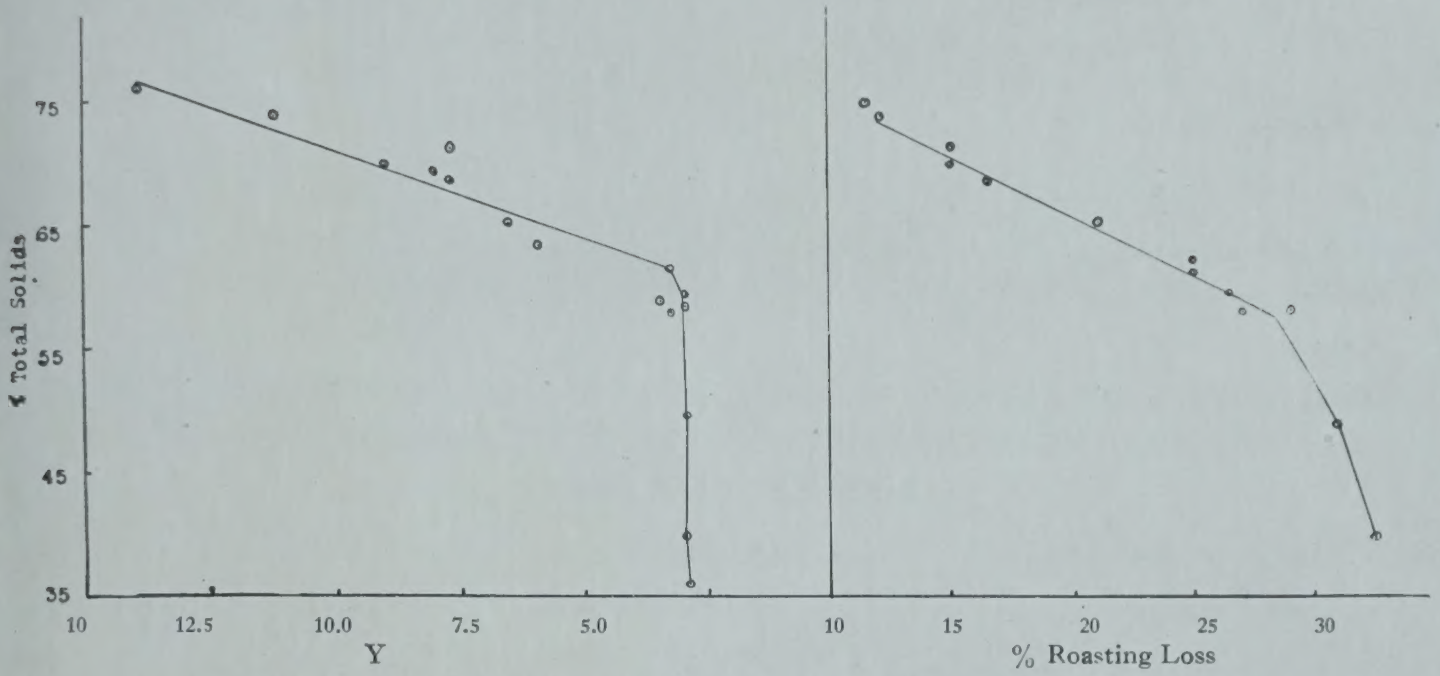

FIG. 1. Relationship of colour and roasting loss to water solubles in chicory.

should compare favourably with that of imported chicory, care has to be given to the roasting conditions.

Summary

1. The water extract in chicory is influenced by the extent of roasting.
2. Temperatures of roasting above 200°C adversely affect the water extractives which go down with progressive roasting.
3. Incorporation of oil makes the roasted powder darker.
4. The chemical composition of some samples of Indian and imported chicory is given. Wide variation in water extracts is of particular interest.
5. While defining chicory, a minimum limit of water extract should be specified.

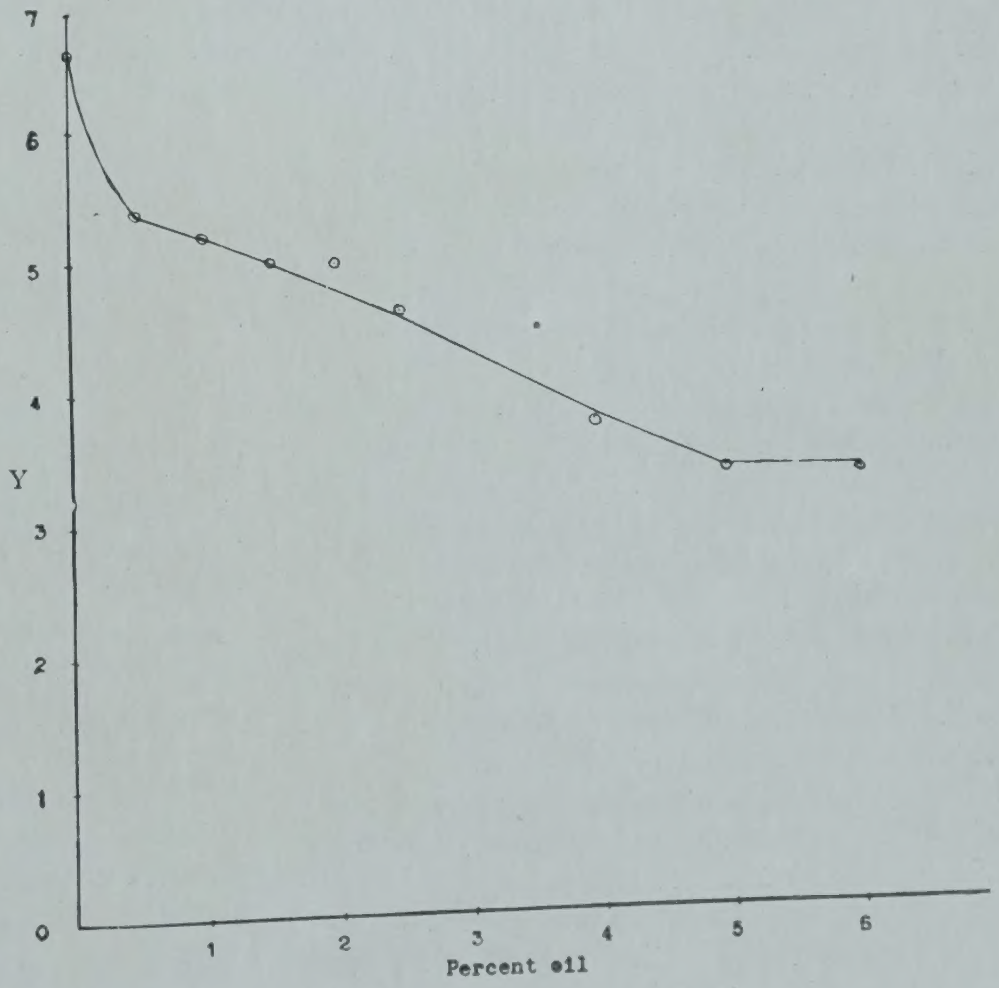

FIG. 2. Changes in colour of roasted chicory powder with the addition of oil.

Ackowledgement

The kind interest taken by Dr V. Subrahmanyan, Director of the Institute is gratefully acknowledged.

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UTILIZATION OF TAPIOCA FLOUR AND LOW FAT GROUNDNUT FLOUR ADMIXED WITH WHEAT FLOUR FOR THE PREPARATION OF CHAPPATI AND POORI

By V. Subrahmanyan, S. V. Chandiramani, R. Rajagopalan, D. S. Bhatia and M. Swaminathan

(*Central Food Technological Research Institute, Mysore*)

Consequent on the present shortage of food grains in the country, it has become increasingly necessary to make up the deficit through other sources. Among these, the most promising are the roots and tubers *e.g.*, tapioca and sweet potato which yield 2-3 times as much calories per acre as cereals. Low fat groundnut flour which is abundantly available as a by-product of the groundnut oil industry could also be used as a protein supplement to tuber and cereal flours. In view of the increasing importance of these products, investigations were carried out in this Institute during the last 6 years on the utilization of tapioca and groundnut flours as partial substitutes for cereals[1-7]. The results of animal experiments and human feeding trials have shown conclusively that (1) 25 parts of the common grains like wheat, rice, and millets can be replaced by tapioca flour without affecting the overall nutritive value of the diets, (2) addition of low fat groundnut flour at low levels (5 per cent) to the above blends effects a further improvement in the nutritive value of the blends and (3) a mixture of 75 parts of tapioca flour and 25 parts of low fat groundnut flour (generally known as Mysore Flour) has a nutritive value similar to that of cereals. Investigations carried out by Subrahmanyan *et al.*[4, 5] have shown that grain substitutes of high nutritive value can be prepared from a blend of tapioca flour, wheat flour and groundnut flour. Bains *et al.*[8] reported that blends of tapioca flour and groundnut flour could be used for the preparation of *chappati* and *poori*. The present study deals with the utilization of tapioca flour and groundnut flour along with whole wheat flour for the preparation of *chappati* and *poori*.

Experimental

Whole wheat flour: Hard variety of Indian wheat was cleaned to remove grit and other foreign matter and ground in a flour mill to pass through 60 mesh sieve.

Tapioca flour: Tapioca flour used in the experiments was prepared according to the method described earlier by Subrahmanyan *et al*[4].

Low fat groundnut flour (*with cuticle*): This was prepared from clean groundnut kernels according to the method of Subrahmanyan *et al*[6].

Low fat groundnut flour (*without cuticle*): This was prepared from de-cuticled groundnut kernels accroding to the procedure described by Subrahmanyan *et al*[4].

The chemical composition of the flour blends calculated using the figures for wheat, tapioca flour and groundnut flours reported by Subrahmanyan *et al.*[1] is given in Table I.

Preparation of dough: The dough was prepared in the usual way by adding the required amount of cold water to the flour blend, mixing and kneading with the hand. The plastic quality

TABLE I. *Chemical composition of whole wheat flour, tapioca flour, groundnut flour and their blends*

Sl. No.	Name of flour	Moisture (g)	Protein Nx 6.25 (g)	Fat (g)	Fibre (g)	Ash (g)	Carbo-hydrate (by diff.)	Calorific value (cal)	Calcium (g)	Phos-phorus (g)	Thiamine (mg)	Riboflavine (mg)	Nicotinic acid (mg)
1.	Whole wheat flour	11.2	11·8	1.3	1.8	1·6	72.4	343	0.04	0.30	0.43	0.14	4.4
2.	Topioca flour	11.4	1.7	0.3	1.9	1.4	83.1	353	0·06	0.08	0.12	0.11	1.8
3.	Low fat groundnut flour (with cuticle)	11·0	49.8	8·9	2.0	4.6	20.8	374	0.07	0.50	0.95	0.20	19.5
4.	Whole wheat flour 75 parts + tapioca flour 25 parts ...	11.2	9.3	1.1	1.8	1.6	74.7	345	0.045	0.245	0.35	0.12	3.8
5.	Whole wheat flour 70 parts + tapioca flour 25 parts + groundnut flour 5 parts ...	11·2	11·3	1.5	1.8	1.7	72.2	347	0.047	0.255	0.38	0·12	4 5
6.	Whole wheat flour 85 parts + groundnut flour 15 parts	11·2	17·6	2.5	1.9	1.8	63.7	349	0.045	0·330	0.51	0.13	6.7

TABLE II. *Quality of Chappati and Poori prepared from blends of whole wheat flour, tapioca flour and low fat groundnut flour*

Sl. No.	Composition of flour blend	Quality of dough	Characteristics of the Chappati			Characteristics of the Poori		
			Colour	Texture	Taste	Colour	Texture	Taste
1.	Wheat flour	Good	Light brown	Soft and elastic	Highly acceptable	Light brown	Crisp	Highly acceptable
2.	Wheat flour 75 parts + tapioca 25 parts ...	,,	Greyish ,,	Very soft & elastic	,,	Light brown	Slightly less crisp	,,
3.	Wheat flour 70 parts + tapioca flour 25 parts + groundnut flour 5 parts...	,,	Greyish ,,	Very soft & elastic	,,	Light brown	Crisp	,,
4.	Wheat flour 85 parts + groundnut flour 15 parts	,,	Light ,,	Soft and elastic	,,	Light brown	Crisp	,,

of the dough was not affected appreciably by the addition of 25 parts of tapioca flour or 30 parts of a blend of tapioca flour and groundnut flour.

Preparation of Chappati: 25 g. of the dough was rolled to a size of 4″ diameter. This was cooked on both sides for a few minutes on a hot plate till the chappati puffed and attained a light brown colour.

Preparation of Poori: 15 g. of the dough was rolled to a size of 2.5″ diameter and fried in vanaspati to a light brown colour.

Organoleptic evaluation: The different samples were organoleptically evaluated by a panel of six judges according to Bains *et al*[8]. The majority opinion of the judges was taken in deciding the acceptability of the product.

Results

The results presented in Table II indicate that the following blends of wheat flour, tapioca flour and groundnut flour are quite suitable for the preparation of *chappati* and *poori*: (1) Wheat flour 75 parts + tapioca flour 25 parts (2) Wheat flour 70 parts + tapioca flour 25 parts + groundnut flour 5 parts and (3) wheat flour 85 parts + groundnut flour 15 parts.

Organoleptic studies revealed that the *chappati* and *poori* prepared from the above flour blends were equally acceptable as those prepared from wheat flour. Replacement of 25 parts of wheat flour by tapioca flour results in a slight reduction in the protein content. Earlier investigations, however, have shown that there is no lowering in the overall nutritive value of the diets containing the blend as compared with wheat flour[1]. Incorporation of 5 parts of low fat groundnut flour makes up for the deficiency of proteins in the tapioca flour. Admixture of low fat groundnut flour at 15 per cent level with wheat flour results in a marked increase in the protein content of the blend. For the purpose of meeting the grain shortage, anyone of the blends described in this paper could be adopted in practice, depending on the regional availability of the raw materials. It would appear, however, that the blend containing 70 parts of wheat flour, 25 parts of tapioca flour and 5 parts of groundnut flour will be the most satisfactory when considered from the point of view of nutritive value and consumer acceptability.

At prevailing costs, a blend of 25 parts of tapioca flour and 5 parts of groundnut flour will cost very much less than an equivalent weight of imported wheat. Thus there will be considerable saving of foreign exchange. Further the country can become self-sufficient in bulk foods and need not be dependent on other countries for its food requirements.

Summary

(1) Investigations have been carried out on the preparation of *chappati* and *poori* from the following blends of whole wheat flour, tapioca flour and groundnut flour: (a) whole wheat flour 75 part + tapioca flour 25 parts (b) whole wheat flou 70 parts + tapioca flour 25 parts + groundnu flour 5 parts and (c) whole wheat flour 8 parts + groundnut flour 15 parts.

(2) Organoleptic evaluation revealed tha the *chappati* and *poori* prepared from the abov flour blends were equally acceptable as thos prepared from wheat flour.

(3) It is concluded that a mixture of tapioca flour and groundnut flour could be used to the extent of 25 to 30 per cent admixed with wheat flour to meet the shortage of grains.

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SUPPLEMENTARY RELATIONS OF THE PROTEINS OF HORSE GRAM AND COW PEA TO THOSE OF ITALIAN MILLET (Setaria Italica)

Italian millet (*Setaria Italica*) is one of the important millets used as a staple food in the diets of poorer classes of people in certain regions of Madras, Andhra and Mysore states. Kadkol *et al*[1] reported that a poor vegetarian diet based on Italian millet promoted a low rate of growth in rats and was inferior in its growth promoting value to a similar diet based on wheat. Chitre and Ganapathy[2] reported that the proteins in Italian millet were deficient in certain essential amino acids especially lysine and tryptophan and promoted a very little growth in albino rats at 10 per cent level. In view of the low biological value of the proteins of Italian millet, it is desirable to include in such a diet, cheap protein sources which can supplement the proteins of Italian millet. The proteins in an average poor vegetarian diet are derived mainly from cereals or millets and to a lesser extent from pulses. Horse gram (*Dolichos biflorus*) and cow pea (*Vigna catiang*) are two of the cheapest pulses available in India. It was therefore considered of importance to study the supplementary relations of proteins of horse gram and cow pea to those of Italian millet.

The biological values of the proteins (protein efficiency ratio) of Italian millet, horse gram, cow pea and the supplementary relations of the proteins of horse gram and cow pea to those of Italian millet were determined by the rat growth method of Osborne, Mendel and Ferry[3] as modified by Swaminathan[4].

Six groups of freshly weaned young albino rats weighing between 40 and 50 g. (5 males and 5 females in each group) were fed synthetic diets in which the millet or pulse or millet + pulse, formed the only source of protein. The diets were adequate with respect to other dietary essentials namely fat, minerals and vitamins. The level of the proteins in the diet was maintained at 10 per cent (in the case of diets containing proteins from two sources, each foodstuff contributed 5 per cent protein). The pulses were powdered and then autoclaved at 15 lb. pressure for 30 minutes to destroy the trypsin inhibitor present, before being incorporated in the diets. Careful records of the daily food intake and the weekly increase in body weight of rats were maintained. Protein efficiency ratios were calculated for periods of 4 weeks and 8 weeks. The results are presented in Table I.

TABLE I. *The supplementary value of proteins of cow pea and horse gram to those of Italian millet* (level of protein in the diets 10%)

Group No.	Diet	Protein efficiency ratio			
		4 weeks		8 weeks	
1.	Italian millet ...	0.78	±0.10 (8 d.f.)	0.62	
2.	Italian millet + Horse gram* ...	1.87		1.58	
3.	Horse gram ...	0.60†		0.49‡	
4.	Italian millet ...	0.80	± 0.07 (16 d.f.)	0.61	±0.05 (16 d.f.)
5.	Italian millet + cow pea* ...	2.30		1.97	
6.	Cow pea ...	1.23		0.98	

* In the case of diet containing millet and pulse, each foodstuff contributed 5 per cent protein.

† In the group of rats fed horse gram diet at the end of 4 weeks, 1 male and 1 female rat lost weight and the average P.E.R given against this group is inclusive of these rats.

‡ In the group of rats fed horse gram diet, at the end of 8 weeks, one male rat died and 2 female rats lost weight, and the average P.E.R. given against this group is exclusive of the dead rat and includes the female rats which lost weight.

The results show that horse gram contains a low quality protein which does not support good growth. Among the rats fed horse gram protein at 10 per cent level, one rat died and two rats lost weight at the end of eight weeks. The low growth of rats on the horse gram protein diet alone, may be due to its deficiency in the amino acid methionine and also to some extent due to the presence of trypsin inhibitor which is not completely destroyed by autoclaving[5]. The present observation confirms the previous findings of Hirwe and Magar[6] who reported that the proteins of horse gram were of an inferior quality and did not promote growth in rats. The results obtained in the present study have shown that the proteins of cow pea and horse gram supplement markedly those of Italian millet. This may be due to the mutual supplementation of amino acids of cow pea and horse gram to those of Italian millet. For example the proteins of cow pea and horse gram are rich in lysine[7, 8] in which Italian millet proteins are deficient.[2, 8] Similarly Italian millet proteins are rich in methionine in which the proteins of the two pulses are deficient. Further studies on the supplementary value of proteins of other pulses and oil seed meals to Italian millet proteins are in progress.

Our thanks are due to Mr A. N. Sankaran for statistical analysis of the results.

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M. Swaminathan
V. Subrahmanyan

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C.F.T.R.I. PUBLICATIONS

1. FOOD AND POPULATION AND DEVELOPMENT OF FOOD INDUSTRIES IN INDIA (*published in July 1952*) pp. xv + 357.

This book brings together the views and suggestions of leading thinkers, industrialists, scientists, demographers and other experts on the two topics. Packed with up-to-date technical and statistical data on several food industries such as fruit preservation, biscuit, chocolate, confectionery, glucose, flour-milling, food yeast, vanaspati, edible oils, fish processing, food machinery and the refrigerated preservation of perishable foods, this authoritative document brings into relief the handicaps and potentialities of these Industries in India An appendix embodying the recommendations of a Committee of Experts, and a comprehensive index enhance the usefulness of the book.

Price: Indian, Rs. 5.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

2. TECHNICAL AID TO FOOD INDUSTRIES (*published in July 1954*), pp. xvi + 270.

This publication, contains the views and suggestions of prominent scientists, leading industrialists and food technologists, and Government officials on the nature of technical aid needed by different food industries in the country. Up-to-date technical and statistical data are provided and an appendix embodying the conclusions of the Symposium as well as a comprehensive index are given.

Price: Indian, Rs. 5.00 (*postage extra*); Foreign, 10 shillings; $ 1.75

3. INDIAN FOOD LAWS (*published in August 1954*) pp. v + 220.

This volume summarizes all important details regarding the history, operation and enforcement of the food laws existing in different States in India, definitions, descriptions and chemical standards for articles of food including permissible additives (colours, flavours and preservatives) and labelling of foodstuffs. The large number of tables on the comparative chemical standards prescribed for different food commodities in various parts of the country make the book useful for reference and guidance for the public analysts and the legal profession.

Price: Indian, Rs. 4.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during December, 1957 are given in this section.

S (IS) 1

Adrenal hormones and mineral metabolism, by M. V. L. Rao, (*December* 7, 1957). Introducing the subject, the speaker briefly reviewed the chemical structure and physiological activities of the various adreno-cortical hormones and pointed out that while cortisone and other gluco-corticoids were 11-oxygenated steriods, the mineralo corticoids like desoxy-corticosterone, hydro-cortisone and aldosterone possessed the 11-deoxy or 11-hydroxy structure. The presence of an aldehyde group on carbon-13 seemed to enhance enormously the salt-retaining activity, aldosterone being 30-100 times as effective as desoxy-corticosterone in its renal and extra-renal effects.

The speaker then explained the background of his own investigations on the effect of adrenal hormones on intestinal electrolyte absorption carried out at the Banting Institute, Toronto, during the tenure of deputation under the Colombo Plan, and mentioned that they stemmed from the earlier observations made in Mysore on the diuretic activity of gastro-duodenal mucosa extracts in certain clinical conditions involving salt and fluid accumulation. The absence of a directly diuretic or antipitressin substance in these extracts prompted him to look for an electrolyte and fluid regulating factor in the gastro-intestinal tract and a systematic study of intestinal electrolyte exchange. He then outlined the technique he had employed to study the rate of absorption of orally administered sodium (as sodium chloride) from the rat gut-a modification of Clark's method (1939). Experimental data were presented on the influence of various adrenal mineralo-corticoids on intestinal sodium ion absorption, which indicated very clearly that aldosterone was most potent in this respect. Quantitative comparison of the dose-response curves showed that aldosterone was 60 times more active than desoxy-corticosterone. The synthetic derivative, 9-α-fluro-hydrocortisone, had been found to be as active as aldosterone whereas compound F and compound B were less active than desoxy-corticosterone.

Careful experimental studies with the long-active radiosodium Na^{22} using *in vitro* intestinal sacks maintained in oxygenated Ringer-saline-bicarbonate medium showed that in presence of aldosterone the rate of transfer of sodium ion from the mucosal to the serosal side was enhanced by nearly 50 per cent, thus confirming the results obtained on intact animals. These studies had also shown that the jejunum was the main salt-absorbing area of the small intestine in the rat.

Orally active mercurial diuretics, Diamox-a powerful carbonic anhydrase inhibitor and diuretic-iodo-acetic acid and 2:4 dinitro-phenol had been found to inhibit the absorption of sodium from the rat gut. These observations had brought out the similarity between the sodium absorbing mechanism in the intestinal villi and the renal nephrons and also indicated that sodium absorption from the gut was an active, energy-requiring process.

The speaker then discussed the implications of his findings and indicated how he proposed to make use of the *in vitro* intestinal preparations for further exploring the mechanism of ion transport in the intestine, the action of aldosterone and other electrolyte hormones and the presence of hitherto unrecognised fluid and electrolyte regulating factors in the gastro-intestinal tract.

A lively, though brief, discussion ensued. Answering the questions raised, the speaker further elucidated the relation between chemical structure and mineralo-corticoid activity and the obligatory relationship between salt and fluid excretion in the organism.

In his concluding remarks, the President observed that studies on hormone action involved patient, hard and careful work. He felt that a great deal of practical application might follow if definite results were achieved.

S (IS) 2

Some studies on B-group vitamins, by R. Radhakrishnamurthy (*December* 16, 1957). After giving a brief account of the methods of separation and identification of the B-group vitamins by paper partition chromatography, the speaker stated that an effort was made to find out a single solvent system which without affecting the basic or acidic nature of the vitamin, will be useful in separating all the members of the B-group on a single chromatogram. The organic phase of the mixture consisting of n-butyl alcohol: methyl alcohol: benzene: water in the proportion 2:1:1:1 was found to space the vitamins over the whole length of the paper and hence could be successfull used. A single phase solvent system consisting of n-butyl alcohol: methyl alcohol: benzene: water (1:2:1:1), earlier used by Mason and Berg to separate tryptophan metabolites, could be employed to further confirm the results obtained with the above solvent system since all the spots were crowded in the upper half of the paper. The identification of the individual vitamins was achieved by employing specific, easily accessible and mostly chemical tests. After describing the tests for identifying all the B-group vitamins excepting pteroyl glutamic acid, the speaker pointed out that the higher limits of identification for the vitamins biotin, B_1, and calcium pantothenate make the tests only of academic interest. The technique was successfully used for checking the presence of vitamins including ascorbic acid in vitamin tablets and also for a detailed study of the excretory pattern of the metabolites of nicotinic acid in faeces from the insect *corcyra cephalonica* st. For the identification of vitamins in natural materials like shark liver residue, the vitamins were liberated from their bound forms by acid or enzymatic hydrolysis employing papain and taka-diastase. Since pteroyl glutamic acid (P.G.A.) could not be identified as a compact spot by the above solvents, phenol saturated with water was successfully used. P.G.A. could be identified upto a concentration of 0.1 μg. by prior oxidation to 2-amino-4-hydroxy pteridine-6-carboxylic acid which exhibits bright blue fluorescence in ultraviolet light. Quantitative evaluation of the spots was also discussed.

After giving a short review of the usefulness and limitations of the technique of inhibition analysis, the relationships observed between riboflavin, inositol and biotin were taken up for discussion. In view of the influence of biotin on amino acid oxidases which have FAD as their coenzyme moiety and the effects of biotin and inositol on the biosynthesis of riboflavin in *Ermothecium ashbyii*, the effect of biotin deficiency caused by supplementing the medium with two powerful biotin antagonists [*viz.* biotin sulphone and γ-3-4 (ureylene cyclohexyl)-butyric acid] was studied. Both the antibiotin compounds inhibited the biosynthesis of riboflavin in *Aspergillus oryzae* by about 30 per cent. The synthesis of inositol in *A. oryzae* and in germinating green gram seeds (*Phaseolus radiatus*) was also decreased by about the same level. In all the cases, the addition of about 10 μg. of biotin reduced the inhibition to about 10 per cent, thus indicating that biotin and inositol have a definite role in the biosynthesis of riboflavin.

In view of the structural similarity and common degradation products between riboflavin and vitamin B_{12} on the one hand and the decrease of pantothenic acid content on feeding vitamin B_{12} observed by Evans *et al.* in chick livers, the relationships between riboflavin, vitamin B_{12} and pantothenic acid were studied in livers of pantothenic acid-deficient rats. The vitamin B_{12} contents of livers of pantothenic acid-deficient rats were twice as much as those of supplemented controls. No increase was observed in the riboflavin contents. In the light of the recent reports by Boxer *et al.* wherein a two-fold increase in CoA content was observed in livers of B_{12}-deficient rats, the results obtained suggested a reciprocal relationship between pantothenic acid and vitamin B_{12}.

During discussion, the speaker pointed out that though accurate quantitative evaluation of the vitamins was not possible, the qualitative data will simplify the detection of vitamins and the use of two different solvents and the specificity of some of the tests confirm the findings to a greater extent. Regarding the relationship between pantothenic acid and vitamin B_{12}, the speaker pointed out that since the normal rats received only an additional quota of calcium pantothenate, the increase observed in vitamin B_{12} was not due to the diet supplied to rats.

The President at the end of the discussion felt that the application of the technique to more complex fruit products would present many difficulties.

S (IS) 3

Studies on the nutritive valu of husked, undermilled an milled rice, by M. Narayana Ra (*December* 21, 1957). Addressin the Seminar, Dr M. Narayana Ra said that rice forms the sta cereal in the diets of more than h the world's population. The deg of milling to which rice is subjec is of vital importance in connection with the problem of nutrition in t Far East. While undermilling increases the B-Vitamin content of rice it also increases the phytin phosphorus content. In view of the fact that poor rice diet is deficient in calcium, an increase in the phytin phosphorus content of rice may have a deleterious effect on the utilization of calcium.

Cullambine and co-workers studied the nitrogen, calcium and phosphorus metabolism in adults fed on diets containing undermilled and milled rice. Their results showed that a moderately polished rice with a high calcium content and a moderate phytic acid content gave the best balances for calcium and phosphorus. Similar investigations on children, however, have not been reported so far. Since the needs of protein, calcium and phosphorus for growing children are greater than those of adults on body weight basis, it was considered of importance to study the metabolism of nitrogen, calcium and phosphorus in children fed on poo vegetarian diets containing husked, undermilled and milled raw rice respectively.

The different samples of rice used in the investigations were prepared from the bulk sample of paddy *Bangaru Sanna* obtained from the Department of Agriculture, Mysore. The experimental subjects were seven girls aged between 8 and 11 years, who were residents of an orphanage in Mysore City. The diets supplied to the experimental children was fairly typical of diets consumed in many parts of South India, consisting mainly of the cereal, rice, and containing only small quantities of pulses and vegetables, with little or no milk, fat, flesh foods or fruit. During the first experimental period the subjects were fed on the diet containing raw milled rice, and during the second and third experimental periods they were fed on diets containing undermilled rice and milled rice respectively.

The mean daily nitrogen intake on the husked, undermilled and milled rice diets was 4.75, 4.50 and 4.30 g. respectively. The mean excretion of nitrogen in the faeces on the husked rice diet (1.65 g) was higher than that found on undermilled (1.542) or milled (1.469) rice diets. All the experimental subjects were in positive nitrogen balance on the three rice diets. The apparent digestibility of the protein in the husked, undermilled and milled rice diets was found to be 65, 66 and 67 per cent respectively. The low figure for the apparent digestibility of protein obtained in these investigations may be due to the very low intake of nitrogen.

Three subjects on husked rice diet and one subject on undermilled rice diet were in negative calcium balance. On the other hand all the subjects on milled rice diet were in positive balance. The mean daily intake of calcium on husked, undermilled and milled rice diets was 276.5, 271.6 and 258.5 mg. respectively. The retention of calcium on milled rice (39.2 mg.) and undermilled rice (33.0 mg.) diets was more than three times that (10.0 mg.) observed on husked rice diet. The loss of calcium in the faeces on the husked rice diet was greater than that found on the other two diets. This was probably due to the high phytate phosphorus, present in the husked rice diet, which is known to interfere in the absorption of calcium by forming insoluble calcium phytate complex. The data clearly indicated that consumption of a poor vegetarian diet based on husked rice is likely to lead to negative calcium balance.

All the subjects on husked, undermilled and milled rice diets were in positive phosphorus balance. The average intakes of phosphorus on husked, undermilled and milled rice diets were 1020, 780 and 575 mg. respectively. The subjects on husked rice diet excreted more phosphorus in faeces than on other diets. The retention of phosphorus on husked and undermilled rice diets was higher than that observed on milled rice diet, because of the high intake of the nutrient on the former two diets. The difference in the average retention of phosphorus by the children on the three different diets were, however, not statistically significant.

During the discussion that followed, several points such as the effect of fermentation and chain reactions in the system, the need for selecting the subjects in such experiments with special reference to the age and occupational factors, the need for adopting a Latin square design to take into account the possible carry-over effects of the previous diets on the succeeding diets, and the effect of fibre in the diet on the faecal bulk were raised. The President in his concluding remarks stressed that the experiments should be carried out on a larger number of subjects over longer periods in order to assess the effect of prolonged consumption of undermilled rice on the general health of the subjects.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Gluten-free wheat flour

E (IS) 1

Kindly let me know the process of preparing gluten-free wheat flour. (Ahmedabad).

For preparing this, wheat flour is made into a dough and the dough is washed repeatedly with water when the starch and other soluble components are dissolved out while the insoluble gluten is left behind as a sticky substance. The water extract can be dried to get back the solids which will be free from gluten.

Low fat groundnut flour

E (IS) 2

I would very much appreciate if you kindly write to me the details of the method of preparing low fat groundnut flour. Is there any precaution to be taken in using steam in the expeller? What preservative do you suggest to keep the powder of the cake for a long time without rancidity developing? (Satara District).

(*i*) Any variety of groundnuts can be used for preparing defatted groundnut flour.

(*ii*) After decorticating the groundnuts, shrivelled kernels and impurities like stones etc., should be removed. A screen shaker would remove most of the dirt, while large pieces of stones and spoiled kernels can be removed by picking them on a conveyer belt. The broken materials present are removed by a blast of air.

(*iii*) For roasting the cleansed kernels on a small scale, an open pan roaster can be used. After roasting, the kernels are cooled and the cuticle removed by rubbing with the hand and then winnowing. On large scale, it can be done mechanically by passing through a blanching machine and removing the separated cuticle by an air blast.

(*iv*) The decuticled kernels are crushed in a carefully cleaned expeller to obtain oil and cake containing about 8-10 per cent fat. No additional precaution other than the usual ones need be taken while passing steam through the expeller. The expeller cake when cooled by exposure to atmosphere contains about 7-8 per cent moisture. This cake keeps well for about four months without any rancidity developing. If, however, the cake is to be kept for longer periods, the cake is powdered and vanillin is added at 20 mg. per cent level, which enhances the storage life by another three months when kept in closed containers. The cake flour to which vanillin is added, should be used only for making biscuits and sweet preparations. The flour can also be preserved by adding spices and salt, in which case, the resulting product should only be used for savoury preparations.

Caffeine from tea waste

E (*IS*) *3*

May I request you to furnish the method of preparing caffeine from tea waste? Are there any firms manufacturing caffeine in India? (Kottayam).

Caffeine is commercially prepared from the tea dust, tea sweepings and tea stick waste products. A number of processes are reported in the literature for the preparation of caffeine. A few of them are given below in brief:

(*i*) The raw material is mixed with lime and extracted with water. The extract is filtered and treated with lead monoxide or magnesia and filtered again. The filtrate can be concentrated and caffeine crystallised. The crude caffeine can then be recrystallised, using carbon black for decolourisation.

(*ii*) Tea is heated with four times its weight of boiling water for 1 hour. The filtered extract is treated with lime (lime to tea 1:1) and the mixture evaporated to dryness. This is then powdered and caffeine is extracted with hot chloroform. Caffeine is then purified by recrystallisation in water.

(*iii*) Tea is treated with alkaline water to dissolve caffeine and the alkaloid is extracted with chloroform and finally recrystallised from water.

Regarding the names of firms manufacturing caffeine in India, you may kindly contact the Drugs Controller, Ministry of Health, New Delhi. The Bengal Chemicals Limited are reported to be manufacturing caffeine.

Infestation in canned products

E (*IS*) *4*

We are packing pearl barley, rolled oats, oat meal and groats in hermetically sealed tin containers but still the products are found to be infested by insects after sometime. Will you, therefore, kindly suggest a method to prevent the infestation in the canned products? (Jammu).

Assuming that the cans are hermetically sealed and are airtight, the infestation that you find in filled cans can be controlled by heating the sealed cans at 60-70°C for at least two hours which will destroy all the insects. Alternatively, the infestation can also be controlled by fumigating the filled cans before seaming with methylbromide at a level of 400 c.c. or about 700 g. per thousand cubic feet of space under airtight conditions. A twenty-four-hour exposure of the cans to the chemical is necessary to destroy all the insects. After this period, the cans should be open for about two hours to let the residual vapours of the chemical escape completely. The cans can then be closed. The chemical is not likely to leave any harmful residue on pearl barley, rolled oats etc., under the above conditions.

Vanilla essence

E (*IS*) *5*

I would highly appreciate your letting me know if apart from carbitol, there are any other non-alcoholic solvents which can be used in the extraction of essence from vanilla beans. (New Delhi).

For the extraction of essence from vanilla beans, non-alcoholic solvents like Carbitol or Solvohol-B can be used. The beans are cut into pieces, bruised and are macerated. The macerated beans are then percolated with 65 per cent Carbitol. Frequently, sugar or glycerol is added during percolation to get thicker extracts. The extracts can be used for flavouring food-stuffs. Carbitol is nothing but diethyleneglycolmonoethylether.

Propylene glycol may also be used as a solvent, but however, this introduces a disagreeable after-taste which is distinctly noticeable even with a small quantity added as vanilla flavouring. Moreover, propylene glycol fails to extract all of the delicate flavour from the vanilla pods.

Manufacture of peanut candy

E (*IS*) *6*

Please suggest me a good recipe for peanut candy and also furnish the details of the method of its preparation. How can it be preserved for a long time? (Bombay).

Recipe for peanut candy and also the method of preparing it are furnished below:

Recipe

Sugar	9	lb.
Corn syrup	7	lb.
Dairy butter	5	oz.
Peanuts (shelled)	8½	lb.

Sugar is dissolved in 3 pints of water. Corn syrup is added followed by butter and the mixture is raised to a temperature of about 235°F. Raw peanuts are added and the mass is stirred continuously when the nuts become roasted. The temperature is then raised to about 300° F, care being taken to see that no scorching takes place. The mass should be a nice golden brown. The kettle is removed from the fire and 2 oz. of bi-carbonate of soda dissolved in the smallest quantity of water, and vanilla essence are added to the mixture. The mass is stirred again to get a uniformly blended mixture. It is then poured on to an oiled slab, the candy spread uniformly and allowed to set. After it is sufficiently cooled, it is cut into suitable sizes for packing.

The preservation of peanut candies presents a number of problems such as softening of nuts, rancidity in the nut, mould growth on the surface in soft boiled candies etc. The rancidity development can be prevented by using antioxidants like Butylated-hydroxy-anisole at a level of 0.02 per cent on the basis of the fat. To prevent mould growth in the case of soft boiled candies, fungistatic agents like sodium-propionate can be used along with the antioxidant. The candies can be stored well at room temperature for nearly a year.

Gum chicle and Balsam Tolu

E (IS) 7

We would be highly obliged if you can enlighten us as to what Gum chicle and Balsam Tolu are, and where these products are used? (Quilon).

Gum chicle and Balsam Tolu are used in the manufacture of chewing gum.

Gum chicle is obtained from the sap of an evergreen tree called the *Achras Sapota* which is indigenous to South America, West Indies and Mexico. The bulk of the world's supply of chicle comes from Mexico and Honduras (Brit.). The sap is obtained by exudation from the incisions made in the bark of the tree. The liquid collected is partially evaporated until it contains about one-third its weight of water. It is then filtered and cooled in moulds to give the chicle gum. Chicle contains two main groups of substances—gutta and resins. The gutta group has elastic properties and is believed to comprise polymers of isoprene. The resin group consists of triterpenes and sterols. It also contains carbohydrates, waxes, tannins and mineral matter partly in the form of calcium compounds. Chicle is very expensive and as such, several natural products are used as fillers, in combination with chicle. These are inferior grade guttas, some derivatives of Borneo-jelutong, waxes such as bee-wax, resins and balsams. Before use in the production of chewing gum, the chicle is broken into small pieces, moulded and passed through a fine sieve to remove foreign matter and lumps.

Tolu Balsam is the resinous material which is obtained from the tree called *Myroxylon Balsamum.* It is widely distributed in South America, being common in parts of Brazil and Argentina. Most of the Tolu Balsam of commerce is obtained from Columbia and Venezuela. To obtain the balsam, the trees are tapped by cutting V-shaped gashes in the bark and the resin is collected. The name Tolu is derived from that of a small town near Cartegena in Columbia. When fresh, the balsam is a soft tenacious, yellowish brown mass, but in time hardens and eventually becomes brittle. It has a pleasing, fragrant odour and balsamic taste. The balsam contains about 80 per cent resin.

Balsams, wax, or resins act as lubricators and eliminate the tackness in chewing gum.

Preparation of chocolate

E (IS) 8

Will you kindly write to me the details of the method of preparation of chocolates? (New Delhi).

A general recipe for preparing chocolates is given below:

Ingredients

Bengalgram flour	10½	oz
Sugar	1¼	oz
Vanaspati	10	oz
Skim milk powder	9	oz
Cocoa powder	½	oz
Vanilla essence	2½	tea spoons
Water	3	cups.

Method

Add skim milk powder to vanaspati and mix till creamy. Add Bengalgram flour and vanilla essence and blend well. Prepare syrup of one thread consistency and stir in cocoa powder. Add Bengalgram flour mixture and cook on low fire, stirring continuously till a mixture of soft ball consistency is formed. Remove to a greased plate and spread evenly. Allow to cool and cut into pieces.

BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products.

Price: Re 1.00 (*postage extra*)

Notes and News

STATISTICAL NOTES

Food Production Statistics for October, 1957

Name of Industry	No. of units	Production during October, 1957
✓Confectionery	34	811 tons
✓Biscuits	27	1,280 ,,
✓Flour milling	34	54,247 ,,
✓Butter (tinned)	5	124 ,,
Cashewnuts	10	2,018 ,,
✓*Dal* and gram flour	1	313 ,,
Aerated water	34	81,818 gross bottles
Beer	2	60,967 bulk gallons
Country spirit	25	3,65,301 L.P. gallons
Indian made foreign liquor	17	45,806 bulk gallons

(*Ministry of Commerce and Industry, Government of India*)

I.S.I. CERTIFICATION MARK FOR B.H.C. FORMULATIONS

The Indian Standards Institution has granted one licence to Messrs. Tata-Fison Private Ltd., Bombay, for the use of the Certification Mark of the I.S.I. on B.H.C. Dusting Powders, and B.H.C. Water Dispersible Powder Concentrates.

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This is the second licence issued to Messrs. Tata-Fison Private Ltd., for pest control products, the first being for D.D.T. formulations. It is expected that the pest control products of other manufacturers would also be covered by the scheme in due course. India requires large quantities of pest control products in combating disease, rearing animals and saving plants from pest nuisance. The production of the materials in the country is continuously increasing. The presence of the Certification Mark on these products would help the consumers in obtaining supplies of ensured quality. If any consumer has any complaint about the quality of B.H.C. formulations bearing the Certification Mark, he may immediately contact the licensee as well as the *Indian Standards Institution, Manak Bhavan 9, Mathura Road, New Delhi.*

SCALE OF CHARGES FOR ADVERTISEMENTS

FOOD SCIENCE

(*A monthly Journal devoted to food science and technology*)

Position		Type Area Screen 120	One Insertion Rs.	Six Insertions Rs.	Twelve Insertions Rs.
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Quarter page	Upright	3″ × 4″	25	135	255
,, ...	Oblong	6″ × 2″			
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Inner front cover page Inner back cover page		8″ × 6″	70	380	715
Back cover page		8″ × 6″	80	430	815
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Communications should be addressed to:

THE EDITOR, *FOOD SCIENCE,* **CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE**
CHELUVAMBA MANSION, V. V. MOHALLA POST, MYSORE

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

GERMAN

BROT AND GEBACK

(Bread and Baked Products)

January 1956, Vol. 10, No. 1.

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DEUTSCHE LEBENSMITTEL-RUNDSCHAU

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

Tetrazolium reduction test in relation to species of fish, pH of the media and incubation period, by Moorjani, M.N. and Iyengar J. R., *Food Sci.*, 1957, **6** (9), 203.—Tetrazolium salts have been used for assessing the quality of various products like milk, fish, etc. The colourless salts are reduced by bacteria to formazan which imparts a red or pink colour indicative of spoilage. The performance of 2-3-5 triphenyl tetrazolium chloride (T.P.T.Z.) with particular reference to species of fish, pH of the reaction media and various incubation periods has been investigated and the results are presented in this paper. The method has been tried with freshly caught river fish, market samples and to frozen fish. 2.5 ml. of press juice from the fish muscle was added to sterile test tubes containing 2.5 ml. of phosphate buffer of specified pH (ranging from 6.2 to 7.5), 10 ml. distilled water and 2.5 mg. of the TPTZ After shaking, the tubes were kept immersed in a thermostat at 38°C. for different periods of incubation. At different intervals, the amount of red formazan formed was determined colorimetrically. It was found that the staler the fish, the quicker was the reduction of the tetrazolium compound. The amount of red formazan formed due to the reduction of TPTZ varies with the species of fish, pH of the media and time of incubation. The amount of formazan increases with the increase in incubation time in all the species studied. For a definite incubation period, the formazan is also found to increase as the pH of the reaction media increases from 6.2 to 6.9 but at a pH beyond 7.0 it decreases. The spoilage of fish can therefore be judged from the time taken for the development of distinct pink colour due to the reduction of TPTZ to formazan. This time factor, however, varies with the species of fish.

K.L.R.

Supplementary value of Indian multipurpose food to poor vegetarian diets based on Italian millet (*Setaria Italica*) **and little millet** (*Panicum milliare*), by Kantha Joseph, *et al.*, *Food Sci.*, 1957, **6** (9), 205.—Italian and little millets which are used as a staple food by the poorer class of people in India are known to promote a very low rate of growth in rats and their proteins are deficient in certain essential amino acids particularly lysine and tryptophan. In the present study, the effect of supplementing these millet diets at 12.5 per cent level with Indian and American Multipurpose foods (low cost protein supplements) has been investigated by the rat growth method. The average weekly increase in weight of the rats fed the control millet diets and the same diets in which 12.5 per cent of the millets was replaced by the Indian or American M.P.F. have been recorded. The results show that both the Multipurpose foods have a marked supplementary value to poor vegetarian diets based on Italian and little millet. No significant difference between Indian and American Multipurpose foods regarding their supplementary value to Italian millet diet could be found. American M.P.F. was however, slightly superior to Indian M.P.F. in its supplementary value to the little millet diet.

K.L.R.

Storage and preservation of food, by Mathur, P. B., *Ann. Rev. Biochem. allied Res.* (*India*), 27, 110.—In this review, researches carried out in India the storage and preservation of and published during 1956 been dealt with under diffe heads *viz.* (1) Fish; (2) F vegetables, betel leaves and by following various tec such as (*a*) cold storage, use fungicidal waxes, fungicides a plant hormones and smoke-cur and (*b*) canning, bottling and pre ration of fruited cereals and frui juice powders; (3) Fats and and (4) cereals, pulses, ce products and dried tubers. references to the literature ha been included.

K.L.R.

Bacterial control of insects. I. Studies on the field control of the lablab pod-boring caterpillar, by Majumder, S. K., M M., and Pingale, S. V., *Indian J. Entomol.*, 1956, **18** (Part IV), 397.—A practically complete control of the lablab pod-boring caterpilla (Fam. Noctuidae) in the fiel through the use of *Bacillus c* var. *thuringiensis* (strain HB-III a pathogenic bacterium isolat from diseased specimens of the insect, is demonstrated. The sp of the bacterium sprayed the food plant at the rate of 5000/sq. in. were found to cause a rapid mortality of the pest when diseased larvae were introd-ed among healthy populations, t disease was found to spread, tho at a rather tardy pace.

The virulence of the bacteri is seen to be affected by continu subculturing on artificial media b was regained when the spores fed to the insect larvae and the bacterium was isolated after the appearance of disease symptoms.

symptoms of the fatal disease produced in the lablab pod-borer larvae by the bacterium are described.

Effects of certain protein foods on blood-sugar levels and glucose tolerance, by Srinivasan, M., *Lancet*, 1957, August 17, 317.—The effects on blood-sugar levels and glucose tolerance of ingesting known quantities of certain protein foods and proteins have been determined in 3 hyperglycaemic men and 2 healthy men.

Casein, protein from tender dolichos (*Dolichos lablab*) and protein from black gram (*Phaseolus mungo*), as also black gram itself, were effective. *Thur dhal* (*Cajanus cajan*), protein from mature dolichos, gelatin, and a mixture of amino-acids as in casein were less effective.

In addition to variation due to proteins, the effects varied with the individuals studied.

Possible mechanisms for the observed effects, and the significance of the results, are discussed.

Indian mandarin oils, their physico-chemical composition and future scope, by Girdhari Lal and Pruthi, J. S., *Indian Food Packer*, 1957, **11** (8), 8.—The orange oil, which is an important by-product recoverable from a fruit juice factory or cannery waste is undoubtedly the most useful of all the citrus oils. It commands a price which justifies economically the extraction of this oil. The recovery of oil from Nagpuri orange peels has been reported to be 1.85 per cent while that from Coorg variety being 2.3 per cent, the cost of production of Nagpur Orange oil being about Rs 6-11-0 per lb.

Tables presenting the annual imports of various citrus oils from 1944 to 1953, analytical results and physico-chemical constants of Nagpur mandarin oil of 1954 season supplied by Central Hindustan Orange and Cold Storage Co. Ltd., Nagpur are given. The U.S. specifications for tangerine oils are also given.

L.N.S.

PART II (Indian)

ANALYTICAL

An improved method for the isolation of L-arginine monohydrochloride via the flavianate by Ramachandran, B.V., *J. sci. industr. Res.*, 1957, **16C** (10), 196.—A comparative study has been made of some of the well-known methods for the isolation of arginine via the flavianate. By determining the losses of arginine at various steps and the conditions under which these losses occur, a method has been worked out by which arginine is obtained as the pure hydrochloride with an average yield of 88 per cent.

Detection of metanil yellow in sweetmeats rich in casein, by Mitra, S. N. and Roy, S. C., *Sci. and Cult.*, 1957, **23** (4), 202.—The AA reported earlier a method for the detection of metanil yellow in foodstuffs like pulses and sweetmeats which are not rich in casein by a wool-dyeing procedure in aqueous solution of the material. This procedure is not useful in the case of sweetmeats like *swandesh*, *rossogolla* etc., which contain a large amount of casein (*channa*) because water, even in presence of ammonia or acid, cannot extract all the colour from the material. The AA report in this note a modified procedure of wool-dyeing using 90 per cent alcohol instead of water, which will strip off all the dye from the casein. The material rich in casein is thoroughly treated with warm 90 per cent alcohol and filtered. The alcohol in the filtrate containing the dye can be removed by boiling the filtrate with excess of water or by evaporating the alcoholic solution to dryness on a waterbath and then taking up the residual mass in water. The aqueous solution of the dye is then used for the usual wool-dyeing procedure and for the chromatographic test for the detection of metanil yellow.

K.L.R.

BIOCHEMISTRY AND NUTRITION

Effect of acetoacetate on reduced glutathione and dehydroascorbic acid of the tissues of scorbutic guinea-pigs, by Behki, R. M., Razdan, M. and Nath, M. C., *J. sci. industr. Res.*, 1957, **16C** (10), 193.—Intraperitoneal injection of sodium acetoacetate to scorbutic guinea-pigs brings about further decrease in the ascorbic acid content of the different tissues, *e.g.*, adrenals, kidney, liver and spleen, the decrease being proportional to the amount of acetoacetate injected. There is also a marked increase in the dehydroascorbic acid content of the tissues, which is practically absent in normal tissues. The GSH contents of tissues of normal as well as scorbutic animals diminish as a result of acetoacetate injection. The mechanism by which acetoacetate causes depletion of blood GSH and gradual development of experimental diabetes has been discussed.

Role of some B-group vitamins in fat metabolism in rice moth larvae (*Corcyra cephalonica St.*), by Radakrishnamurthy, R., Sivarama Sastry, K. and Sarma P. S., *J. sci. industr. Res.*, 1957, **16C** (11), 221.—Supplementation of L-cystine at 0.4 per cent level to the diet of rice moth larvae (*Corcyra cephalonica St.*) causes an inhibition of growth and increases accumulation of fat. DL-tryptophan completely reverses both the conditions whereas some of the B-group vitamins are partially effective. Biotin at 100 μg. per cent level in the diet gives similar response. Inositol is capable of reversing growth inhibition completely at 0.1 per cent level.

Efficiency of pulse proteins in maintaining liver xanthine oxidase in rats, by Esh, G. S. and Som, J. M., *Ann. Biochem. exptl. Med.*, 1957, **17** (4), 117.—The AA have carried out feeding trials with rats to assess the influence of pulse proteins *viz*: Bengalgram and lentil on the promotion of xanthine oxidase activity in the liver of rats fed at different states of growth and maintenance with and without supplementation of methionine in which the pulses are deficient. The animals were fed the two pulses at different protein levels along with the basal diet for a definite period after which they were decapitated and the livers taken out. The liver nitrogen was determined by the micro-Kjeldahl technique and the enzyme activity was measured by following the colorimetric method as outlined by Litwach and co-workers. The animals were also weighed twice weekly. The results have been compared with that obtained with the casein diet. From the experiment with adult rats, it was found the oxidase activity with the pulse diets was lower than that with the casein diet and supplementation of the pulse diets with methionine made up this difference. With weanling rats fed on Bengal gram, lentil and casein diets at 6 per cent, 12 per cent and 18 per cent protein intake levels, there was not much difference observed in the enzymic activity of the liver although the activity was consistently higher in the case of pulse diets supplemented with methionine as compared to the casein diet. Protein-depleted adult rats were fed on intact pulse proteins, casein and their hydrolysates, and protein efficiency ratio, nitrogen content and xanthine oxidase activity of the liver were determined. The results show no appreciable difference in the enzymic activity of the liver of rats. When the diets were supplemented with methionine, there was increased enzymic activity. In all the experiments, it was observed that the nitrogen content of the liver was independent of the nature and quantitative variations of protein intake.

K.L.R.

Some aspects of food canning —2, by Littlejohn, G. S., *Indian Food Packer*, 1957, **11** (7), 9.—An outline of some of the factors involved in physical spoilage due to faulty manufacturing techniques, bacterial spoilage of canned foods and container corrosion is given. Losses due to poor handling of the raw materials prior to packing and those due to poor filling and processing practice have also been discussed under the heading of physical spoilage.

L.N.S.

Some aspects of food canning —3: chlorination of cooling water, by Littlejohn, G. S., *Indian Food Packer*, 1957, **11** (8), 21.—It is well known that even correctly formed double seams may allow minute quantity of water to enter the can during cooling because at the time when the can begins to develop a vacuum the seams are probably expanded slightly and the lining compound is soft. If this water is potable no damage is caused, but if the water is infected it results in spoilage of the canned product. To prevent the spoilage due to cooling water, it is chlorinated by using bleaching powder, hypochlorite solution or chlorine gas.

At first the impurities in the water consume some chlorine depending on its 'chlorine demand'. The chlorine which is left, is the 'total residual chlorine' which consists of the combined residual chlorine *viz*: chloronitrogen compounds as chloramines which have a very slow germicidal action and the free residual chlorine as hyphochlorous acid and the hyphochlorite ion which has high germicidal action. (The quantity of chlorine to be added depends on pH, temperature and the amount of organic matter. If chlorine is in contact with water for at least 15 minutes a chlorine level of 2-3 p.p.m. should be sufficient if the break point has been attained and free chlorine is present). The starch iodide test for chloride indicates only total residual chlorine and does not distinguish between free and combined chlorine. A qualitative test for free chlorine which can be easily carried out by using neutral ortho-tollidine is given. The reagent is prepared by crushing 1.0 g. of specially purified orthotolidine with 5 ml. of 20 per cent v/v HCl and diluting to one litre. Place two drops of the reagent in a 50 ml. Nessler cylinder and add 50 ml. of the water sample. A golden yellow colour indicates the presence of free chlorine.

L.N.S.

The use of low methoxyl pectins in fruit canning, by Gallop, R. A., *Indian Food Packer*, 1957, **11** (9), 9.—In canned berry fruits, quality deterioration has seriously embarrassed the packers of these products. The deterioration affects the colour, flavour and general appearance of the packs, particularly those packed in glass containers. A considerable amount of work has been done on the use of low methoxyl pectins (pectin with methoxyl contents between 0.5 to 7 per cent). In particular, it has been ascertained that by adopting the recommended procedure according to the A, the addition of low methoxyl pectin to the syrup in canned berry fruits brings about notable improvement in quality. The mechanical protection of the berries might also be achieved by using low methoxyl pectins to increase the viscosity of the syrup without causing gelation. The process described is cheap and as the substances added (low methoxyl and citric acid) are both of fruit origin, should not cause any concern on grounds of public health.

L.N.S.

INSECTICIDES

New insecticides, by Tiwari, S. S. and Tripathi, B. N., *Curr. Sci.*, 1957, **26** (12), 397.—The chloracetyl and 2-furoyl groups are known to be powerful insect poisonous components. The AA have, therefore, tested the insecticidal action of chloracetates of various substituted phenols and the ortho-hydroxyketones and various phenyl 2-furoates and the corresponding orthoydroxy 2-furophenones. In all 26 compounds have been tested for their insecticidal activity against common house-flies by noting the time for 50 and 100 per cent knock down and the performance of the new compounds have been compared with the activities of standard insecticides *viz*: D.D.T., B.H.C. and pyrethrin under identical conditions: The temperature and R. H. during the experiment were maintained at 28-30° C and 76-83 per cent. The results have been reported in a table. It is found that the derivatives of chloracetic acid have very high knock down value, 100 per cent knock down being observed in less than a minute in a few cases. Most of the compounds studied are much more effective than D.D.T. and B.H.C. A few of the phenyl chloracetates (*viz*: 3-ethyl phenyl chloracetate) are about 20 times more active. The contribution of halogen atoms attached to the phenyl nucleus towards the insecticidal activity seems to be not very prominent.

K.L.R.

Comparative efficacy and economics of pyrethrins and mixtures of pyrethrins and piperonyl butoxide as space sprays against flies and mosquitoes, by Gharpure, P. B. and Perti, S. L., *J. sci. industr. Res.*, 1957, **16A** (10), 469.—The toxicity of pyrethrin-piperonyl butoxide mixtures in relation to pyrethrins when used as space sprays against the house-fly, *Musca nebulo* Linn., and the mosquito, *Culex fatigans* Wied., have been investigated. The relative costs based on efficacy have also been worked out.

For comparable rates of knockdown the pyrethrins are more economical than the mixtures of pyrethrins with piperonyl butoxide against both flies and mosquitoes. In effecting comparable levels of high knockdown and high mortality, however, the mixtures are more economical than the pyrethrins against both flies and mosquitoes.

MICROBIOLOGY

Drug resistance in yeast (*Saccaromyces cerevisiae*), by Sharma T. R. and Shukla, J. P., *J. sci. industr. Res.*, 1957, **16C** (11), 214.—The development of resistance in yeast (*S. cerevisiae*) towards Gentian violet and Cerefak has been studied. The organism, after repeated subculturing in a standard medium containing appropriate amounts of the inhibitor, becomes resistant to the action of the drugs. The stability of drug resistance developed by the adapted strain is partially lost when it is passaged a number of times through the drug-free medium.

Two distinct types of colonies have been isolated by growing the trained strain on White and Munn's medium solidified with agar.

Influence of concentration of mineral nutrients on fat synthesis by *penicillium aurantio brunneum*, by Singh, J. and Gurmit Singh, *J. sci. industr. Res.*, 1957, **16C** (11), 219.—The effect of ammonium nitrate, potassium sulphate, magnesium sulphate and sodium dihydrogen phosphate at different levels of concentration on fat synthesis in culture of *Penicillium aurantiobrunneum* has been studied. Best results are obtained in the presence of 0.45 g. of ammonium nitrate, 0.088 g. of potassium sulphate, 0. 25 g. of magnesium sulphate, and 0. 73 g. of sodium dihydrogen phosphate per 100 ml. of medium. Felts containing 20.6 per cent of fat have been harvested.

OILS AND FATS

Progressive hydrolysis of groundnut oil by castor bean lipase, by Nizamuddin H. and Kulkarni, B.S., *J. sci. industr. Res.*, 1957, **16C** (11), 217.—Progressive hydrolysis of groundnut oil by castor bean lipase has been studied with reference to the characteristics of the unsplit residue and the fatty acids obtained at various stages of hydrolysis. Changes in saponification and iodine values were more marked with fatty acids than with unsplit residue. The proportion of monoglycerides is uniformly low during the course of hydrolysis and does not exceed 3.5 per cent.

PART III (Foreign)

ANALYTICAL

Colorimetric determination of toxaphane, by Irwin Hornstein, *J. agric. Fd. Chem.*, 1957, **5** (6), 446.—A method has been developed for determining as little as 0.5 mg. of toxaphane or 0.25 mg. of Strobane is 5 ml. of solution, and has been applied to alfalfa and butterfat extract. In tests with other chlorinated insecticides, interferences were encountered only with chlordan and heptachlor.

Quantitative determination of L-glutamic acid by L-glutamic acid decarboxylase (from *E. coli*), by Seidman, M. and Blish M.J., *J. agric. Fd. chem.*, 1957, **5**(6), 448.—An accurate method adaptable for the routine determination of L-glutamic acid in foods and pharmaceuticals, raw materials used in manufacturing monosodium glutamate, and plant process streams was needed. A modification of the method of Umbreit and Gunsalus, using L-glutamic acid decarboxylase prepared from *Escherichia coli* ATCC strain 4157 gives values, which are accurate and reproducible within narrow limits, and is well adapted to routine analytical work.

BIOCHEMISTRY AND NUTRITION

Relative nutritive values of proteins in various foods at increasingly high levels of protein intake, by Barnett Sure, *J. agric. Fd. Chem.*, 1957, **5** (6), 463.—The nutritive value of the proteins in various foods at increasingly high levels of protein intake was studied for possible practical application in poultry and livestock feeding. Protein efficiency decreases with increased protein intake because there is greater waste in metabolism with the increased ingestion of protein. In all the foods studied, 15 per cent was the most efficient level of protein intake.

Nutritive value of quinua proteins, by Quiros-perez, F. and Elvehjem, C. A., *J. agric. Fd. Chem.*, 1957, 5 (7), 538.—Quinua (*Chenopodium quinoa*, Willd), an Incan seed, used in human nutrition, supplies protein of high quality as judged by growth and lipotropic responses in white weanling rats. Under experimental conditions, at least seven essential amino acids had to be added to produce slightly better weight gains than that given by 90 per cent quinua alone. Combinations of quinua and casein, giving the same total dietary protein as that supplied by quinua alone did not support better growth than quinua, confirming the findings of other workers. However, the addition of 3 per cent casein to quinua, giving a total dietary protein of 12.42 per cent, produced an excellent growth of 36.7 grams per rat per week and a normal liver fat.

Enhancement of vitamin B_{12} absorption by substances other than intrinsic factors, by Greenberg, S. M., *et al.*, *Nature*, 1957, **180,** 1401.—The level of intrinsic factor present in a test animal is known to control the extent of vitamin B_{12} absorption but a commercial preparation of vitamin B_{12} called 'Liptril' which is free of intrinsic factors has been found to increase the B_{12} absorption in human subjects. The AA have studied the influence of the same product in the case of normal and B_{12} deficient rats. A formulation (modified 'Liptril') similar to the commercial preparation in all respects except that vitamin B_{12} was omitted, was prepared and used for the studies. A 15 per cent alcohol-water solution was used as control. Equal quantity of vitamin B_{12} was added to the solutions and these were administered five times weekly for about 2 weeks to rats fed and given tap water *ad libitum*. Blood samples were taken from the animals 24 hours after the last dose and serum B_{12} levels were estimated microbiologically. It was found that both in normal and B_{12} deficient rats, a higher absorption of vitamin B_{12} resulted in the case of rats administered with the modified 'Liptril' solution. The active principle responsible for the increase in vitamin B_{12} absorption was determined by carrying out systematic analysis of 'Liptril' by the modified Schilling test and the kidney tissue storage level test wherein radioactive B_{12} *viz.* Cobalt-60 B_{12} was used along with the test sample of 'Liptril'. The details of the two methods are given. It was established by the two tests that 28 per cent D-sorbitol solution which was a component of the commercial preparation 'Liptril' was the active agent. As a result of this finding several other carbohydrates were tested for this property and the AA have found that some carbohydrates *viz.* D-mannitol, L-sorbose and D-xylose enhanced the B_{12} absorption while sucrose, D-galactose, D-glucose, D-fructose and D-mannose failed to show any such increase. The intrinsic factor in an animal is a mucoprotein or a mucoploypetide containing a high percentage of hexosamine fucose, galactose and other reducing sugars. The present findings by the AA suggest that the carbohydrate portion of the intrinsic factor plays a prominent role in effecting B_{12} absorption. Two theories for the mechanism of action of these active carbohydrates in enhancing the vitamin B_{12} absorption have been given.

K.L.R.

Inhibition of ascorbic acid oxidase by thiourea, by Mayer, A. M., *Nature*, 1957, **180,** 1417.—It has been shown by earlier workers that thiourea does not inhibit the activity of the ascorbic acid oxidase. Contrary to this, the A has found that the enzyme activity is reduced by thiourea as a result of his experiments on germinating lettuce seed. Extracts of the seeds were prepared and the oxidase activity was measured by the Warburg technique. It was found that extracts of seeds germinated in water has a high oxygen uptake. The studies on the effect of different concentrations of thiourea both *in vitro* and *in vivo* on the ascorbic acid oxidase activity of the extracts of lettuce seeds show a high inhibition due to thiourea, comparable to that caused by cyanide. The inhibition caused *in vivo* could not be removed even by thoroughly washing the seeds germinated in the thiourea and the *in vitro* inhibition was not reversed by dialysis of extracts to which thiourea had been added. The results indicate that thiourea inhibits oxidase activity *in vitro* and *in vivo*, probably due to its copper complexing action.

K.L.R.

The availability of lysine from *Torula* yeast, by Wei S. Tsein, Johnson, E. L. and Liener, I. E., *Arch. Biochem. Biophys.*, 1957, **71** (2), 414.—The AA have investigated the extent of availability of lysine from *Torula* yeast which is used as a supplementary protein source by feeding experiments with chicks and rats. Chicks were divided into three different groups and one group was fed the basal diet which provided all the dietary essentials except lysine. The second group was fed the basal diet supplemented with different levels of synthetic lysine and the third group of chicks was fed the basal diet supplemented with *Torula* yeast at levels of 5, 10, 15 and 20 per cent of the basal diet. Weight changes and total food consumption were recorded throughout the experimental period of 3 weeks. Feed efficiency and nitrogen retention was also determined. The experiment has been carried out with different groups of rats fed a control basal diet of amino-acid mixtures, basal diet supplemented with synthetic lysine at different levels and the basal ration supplemented with 7, 14 and 21 per cent *Torula* yeast. The nitrogen of the diets fed to the different groups was adjusted to the same level. Gain in weight, protein efficiency and lysine absorption have been determined during the three-week feeding period. The results show that the growth responses in chicks and rats fed lysine-deficient diets supplemented with 15-20 per cent *Torula* yeast was consistently greater than could be accounted for on the basis of the lysine so provided. This may probably be due to the presence of unidentified nutrients in *Torula* yeast and as such the growth rate data cannot be taken as an index for evaluating lysine availability. The nitrogen retention data expressed on a *per unit body weight* basis indicate that yeast lysine was about 75 per cent as available to the chick as the synthetic lysine. It was, however, found from the rat studies that 90 per cent of the lysine of *Torula* yeast was available to the rat.

K.L.R.

The effect of phosphorus deficiency on the free amino acids of alfalfa, by Gleiter, M. E. and Parker, H. E., *Arch. Biochem. Biophys.*, 1957, **71** (2), 430.—Studies on the mineral nutrition of plants have shown that the metabolism of certain amino acids is strongly affected by various mineral deficiencies. The AA have studied the variations in the concentration of the free amino acids of normal and phosphorus-deficient alfalfa by the application of quantitative column chromatography. Alfalfa was grown in sand culture in pots providing all the elements known to be required for plant growth. To one set of plants, phosphorus was supplied at a rate of 31 p.p.m. and to another only 3.8 p.p.m. After 6 months, all the phosphorus was withheld from the latter group thus resulting in phosphorus-deficient alfalfa. The dry leaves of the two groups of plants were analysed for total N and alcohol soluble N in the leaf extracts and total P. Ethanol (80 per cent) extracts of the control and phosphorus deficient leaves were used for the quantitative chromatographic estimation of free amino acids according to the Moore and Stein method. Proline and tryptophan were determined by colorimetric methods. The results showed that total N and total P contents were slightly lower in the case of phosphorus-deficient leaves as compared to control alfalfa leaves. The alcohol soluble nitrogen content was, however, 1.1—2.5 times as much as in the control leaves. The free amino acid analysis showed that the amounts of asparagine, glutamine and arginine were higher and the amount of glutamic acid was lower in alcohol extracts of phosphorus-deficient alfalfa leaves than in the extract of control leaves. The arginine content of phosphorus deficient extracts showed increases from 4.2 to 20.2 times that concentration found in control leaf extracts. Proline also showed a slight decrease but the rest of the amino acids did not show any consistent changes but the experimental and control alfalfa leaves.

K.L.R.

Diet composition and mineral balance in guinea pigs, by O'Dell, B. L., *et al.*, *J. Nutr.*, 1957, **63** (1), 65.—Guinea pigs near maturity were used to study the effect of type of bulk, and of dietary levels of potassium, magnesium and phosphorus on apparent absorption and retention of calcium, magnesium, potassium, sodium and phosphorus.

The most significant observation was that high dietary levels of phosphorus caused a negative balance of magnesium in guinea pigs that received about 0.1 per cent of magnesium in the diet. The low retention was primarily due to the decreased absorption of magnesium in the presence of excess phosphorus regardless of the magnesium level. A similar though less marked effect was observed on the absorption and retention of potassium and calcium.

Gum arabic was found to be highly digestible whereas celluflour was essentially indigestible. The absorption of all cations was about 10 percentage points higher from diets that contained gum arabic than from those that contained celluflour.

Guinea pigs absorbed approximately 70 per cent of the calcium and 90 per cent of the magnesium consumed when they were fed a purified diet that contained 0.9 per cent of calcium, 0.3 per cent of magnesium and 0.4 per cent of phosphorus. Large portions of the excreted calcium and magnesium, 62 and 87 per cent respectively, were eliminated by way of the kidneys.

The effect of radiation sterilization on the nutritive value of foods—II. Biological value of pea and lima bean proteins, by Metta, V. C., Norton H. W. and Johnson, B. C., *J. Nutr.*, 1957, **63** (1), 143.—The effect of irradiation sterilization and of heat cooking on the nutritive value of the protein in the fresh frozen garden pea and the lima bean was studied by the Thomas-Mitchell method. A 3 million gamma irradiation was used to sterilize the frozen canned samples. No significant loss in nitrogen of the peas or beans resulted due to irradiation. The diet containing irradiated peas was found acceptable to the rat. Irradiation of the lima beans did not improve the poor consumption of the raw lima bean diet.

Irradiation sterilization, like heat cooking, did not affect the digestibility of the raw pea protein (92 per cent). While the biological value of the pea protein (58 per cent) was also not affected by short-time cooking, irradiation sterilization with 3 million dosage reduced it by 8 per cent.

The rats consumed the raw lima bean diets reluctantly, and heat cooking improved markedly the acceptability of these diets. Cooking also increased the digestibility by 9 per cent and the biological value by 12 per cent. On the other hand, irradiation of the raw lima beans with 3 or even 10 million did not significantly improve the digestibility or the biological value of their protein. These findings are apparently the result of the trypsin inhibitor present in raw lima beans which thus appears to be destroyed by heat and not by irradiation. No difference in the nutritive value of the lima bean protein was found when the heat-cooked beans were compared with the irradiated and subsequently cooked lima beans. This indicates no damage to the lima bean protein due to irradiation.

CEREALS

Effect of insect infestation on stored grain. II.—Studies on husked, hand-pounded and milled raw rice and parboiled milled rice, by Pingale S. V., *et al.*, *J. Sci. Fd. Agric.*, 1957, 8 (9), 512.—Husked, hand-pounded, milled raw rice and parboiled milled rice obtained from the same strain of paddy (Halubbulu) were infested by *Calandra* (*Sitophilus*) *oryzae* (rice weevil) for a period of eight months and the changes brought about in the different samples due to infestation have been studied. The results show that husked rice was infested to a greater extent than the other samples and developed an unhealthy appearance within two months of infestation. Infestation of the rice grain increased the loss of starch in the gruel during cooking, the loss being maximum in the case of husked rice. An appreciable increase in the acidity of fat and a decrease in the thiamine content due to insect damage were observed. No significant difference was noted in the other constituents of the grain, such as total nitrogen and soluble nitrogen. Some correlation was observed between the weight volume ratio of uncleaned grain and the proportion of dust, loss in total weight, loss in thiamine and insect population.

FISH

Chemical changes occurring in cod muscle during chill storage and their possibe use as objective indices of quality, by Shewan, J. M. and Jones, N. R., *J. Sci. Fd. Agric.*, 1957, **8** (8), 491.—Studies have been made on the extractives and volatile substances (amino-acids, amines, and other nitrogenous compounds, sugars, etc.) of freshly caught cod muscle and some of the changes that occur during autolysis (storage at 0° under sterile conditions) alone or combined with bacterial spoilage as in normal trade practice (storage in ice). The merits of some of these changes as objective indices of quality, particularly in relation to taste panel assessment, are discussed.

Denaturation of fish proteins, by Luijpen, A. F. M. G., *Nature*, 1957, **180**, 1422.—The A has determined the soluble nitrogen content of quick-frozen cod samples stored at different temperatures and the values were compared with the degree of toughness of the fish after boiling at regular intervals assessed by organoleptic evaluation. In the samples stored at—10° C, the toughness increased and the soluble nitrogen content decreased with time. There was a close correlation between the increase of toughness and decrease of the ratio of soluble nitrogen to total nitrogen. No such correlation could, however, be noticed in the case of samples stored at −20°C and −30°C. This indicates that in practice, the determination of soluble N (or protein) expressed as percentage of total N, cannot be used as an objective standard for the toughness of cold-stored fish. Soluble N content was also determined in the case of cod, quick-frozen at different degrees of freshness and stored at −10°C. The results shown in a graph proved that in samples of fish frozen in fresh condition, the protein denaturation was quicker and greater than in fish frozen in advanced spoiled condition. This shows that in spoiled fish, the proteins have been decomposed by bacteria and enzymes to such an extent that they are less liable to denaturation. Protein denaturation in frozen fish being connected with the toughness, is different from the normal denaturation of proteins caused by heating. In the case of fresh fish stored above the freezing point (−1 to +24°C), no such protein denaturation could be found. This only shows that the protein is degraded by bacteria and enzymes at such a fast rate that it is difficult to see any denaturation. This hypothesis has been proved by the A. by storing sterile (γ-irradiated) fish proteins at +10° and +24°C when considerable denaturation was found to occur. There is, however, a major disadvantage in that by irradiation itself much protein is denatured.

K.L.R.

FRUITS AND VEGETABLES

Amino acids in nine frozen vegetables, by Murphy, D. M., *et al.*, *J. agric. Fd. Chem.*, 1957, **5** (8), 608.—Ten amino acids were determined in composite samples of nine frozen vegetables. The vegetables were rich in all the essential amino acids except methionine dan tryptophan which were present only in low concentration. Legumes are the highest in protein content, but, however, on the basis of the weight of each amino acid per gram of total nitrogen, the amino acid composition in the various products is almost similar. The amino acids were determined by the microbiological method using *Lactobacillus delbrueckii* 3 for arginine, *Streptococcus faecalis R* for threonine, *Lactobacillus arabinosus* 17-5 for tryptophan and *Leuconostoc mesenteroides* p-60 for others.

G.V.K.M.

Effects of processing conditions on the chemical properties of canned sweet potatoes, by Arthur, J. C. and McLemose, T. A., *J. agric. Fd. Chem.*, 1957, **5** (11), 863.—Effects of various processing conditions on the chemical properties of two varieties of sweet potatoes were determined. The amount of beta-carotene was not much affected by preheating, peeling, cooking or by the addition of sugar. The amount of ascorbic acid was not affected by added sugar but was substantially reduced by processing and was slightly more reduced with longer cooking times particularly when combined with high concentration of lye peeling. The amount of total sugars in canned product increased to a greater extent than accounted for by the added syrup, due to hydrolysis of starch during processing, but the increase is almost constant, being unaffected by other factors. For added liquid media of 0° and 18° Brix, the cut out Brix was greater than the added Brix; for added syrup of 25° Brix, the cut out Brix was the same; and for added syrup of 35° Brix, the cut out Brix was less than the added Brix. Peeling and cooking apparently did not affect the results.

INSECTICIDES

Effects of chlorinated hydrocarbon insecticides on flavours of vegetables, by Birdsall, J. J., Weckel, K. G. and Chapman, R. K. *J. agric. Fd. Chem.*, 1957, **5** (7), 523.—Aldrin, dieldrin, endrin, chlordan, heptachlor, lindane, and toxaphene were tested for their possible effects on the flavour of 12 vegetable crops. The treated vegetables were evaluated in the form or forms in which they are most commonly consumed. The triangular taste tests indicated that lindane treatments caused considerable damage to the flavour of most of the crops studied. Other insecticides were less pronounced in their effects on flavour. The results of flavour evaluations after prolonged storage of insecticide-treated raw and canned vegetables were similar to results obtained with fresh samples. Changes in flavour were more pronounced in canned samples than in raw or cooked samples.

OILS AND FATS

Changes induced by autoclaving a solvent-extracted cotton seed meal, by Conkerton, E. J., *et al.*, *J. agric. Fd. Chem.*, 1957, **5** (6), 460.—The effect of autoclaving a prime-quality solvent-extracted meal upon its soluble protein fractions was studied to determine chemical differences between cottonseed meals of known and varied nutritive value. Portions of both the original and the autoclaved meal were fractionated, by successive extractions, with water, saline, and dilute alkali. Autoclaving modified the solubility behaviour of the cottonseed protein, and reduced the sugar, lysine, and arginine contents of the meal. Results showed that simple measurement of the solubility of nitrogen in the meal, commonly used to indicate the degree of heat damage to a meal, does not reflect the complete change induced in cottonseed protein by heat.

A spectrophotometric method for the evaluation of vegetable oil colours, by Pohle, W. D. and Tierney, S. E., *J. Amer. Oil Chem. Soc.*, 1957, **34** (10), 485.—A means for evaluating oil colour on the basis of an optical density measurement at 500 millimicrons has been proposed. The amount of chlorophyll would be taken into account by present methods or an adaptation of these methods.

The advantages of the proposed means of evaluating oil colour are that it expresses more exactly the amount of colour in the oil, provides a more accurate estimate of colour removal during bleaching, and makes possible more exact evaluation of bleaching earth.

Data have been presented on the colour value (optical density × 100) of refined and bleached oils, possible variation in value obtained from different laboratories, estimation of colour removed during bleaching, evaluation of bleaching earth, and relationship between colour of refined and bleached oils prepared in the laboratory by the official method.

PACKAGING

Film packaging of heat processed orange juice products, I.—Some factors affecting the stability of the product, by Manheim, H. C., Nelson A. I. and Steinberg, M. P., *Food Technol.*, 1957, **11** (8), 417.—The AA have carried out experiments to ascertain the suitability of plastic or flexible films for packaging orange juice investigating factors such as peel oil or pulp, processing time and temperature relationship to obtain a sterile and enzymatically inactive juice and the effect of light on the prolonged storage of the product. The effects of two processing times, two temperatures and the addition of three preservatives were studied. Sorbic acid and sodium benzoate were found to be undesirable additives while sulphur dioxide proved beneficial. The favourable temperatures were 210° F for single strength juice and 220° F for concentrated juice. It was also found that the peel oil did not cause any deterioration in flavour and that light had no effect on the quality of the juice. B.V.S.

Film packaging of heat processed orange juice products, II.—Storage study, by Manheim, H. C., Nelson, A. J. and Steinberg, M. P., *Food Technol.*, 1957, **11** (8), 421.—In this study the AA have investigated the suitability of several plastic films as containers for thermally processed orange juice and orange juice concentrate, selecting such films as would have low moisture and oxygen transmission and were heat stable using four different films. Keeping storage temperature and the addition of sulphur dioxide as variables and maintaining canned juice products as controls, they have carried out the storage study for a twenty-week period.

Juice packages in Saran and aluminium-polyethylene pouches at 36° F was found to be acceptable after five months of storage. Concentrated juice generally maintained a better quality than single strength juice. Addition of SO_2 at 200 p.p.m. to juice packaged in aluminium-polyethylene or Saran would help in storing the juice even at temperatures upto 74° F.

B.V.S.

STORAGE

Effect of cold storage on the fluoride content of alfalfa, by MaCarty, C. P. and Robinson, E., *J. agric. Fd. Chem.*, 1957, **5** (5) 379.—The tediousness of determinations of fluoride in vegetation samples, coupled with a frequent need to gather a large number of samples in a short time, usually requires storage of samples prior to analysis. Tests using alfalfa samples were conducted to determine the effect of storage at 0° F. for 4 to 6 weeks on fluoride content. Stored samples show more variation than unstored samples, but no consistent change in flouride content. The variation can be reduced by adding lime to stored samples. Samples stored in a tight container do not gain or lose moisture consistently.

J.S.P.

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STABILITY OF TANNIN-LIKE CONSTITUENTS AND CAFFEINE IN COFFEE BREW

By C. P. Natarajan, R. Balakrishnan Nair, N. Gopalakrishna Rao and D. S. Bhatia

(Central Food Technological Research Institute, Mysore)

The polyphenolic constituents and caffeine e the two most important constituents in coffee rew. The nature of the changes, if any, taking lace during storage of coffee brew under different onditions has not so far been reported. The resent paper deals with such studies on these onstituents in coffee brew.

Experimental

1. *Effect of different methods of preparation n the extraction of chlorogenic acid by water:* 5 per cent (w/v) brew was prepared by using e following devices: (i) Steeping (5 minutes) i) Drip method (iii) Percolator method v) Vacuum method (v) Steeping for 5 minutes d after rinsing the container with boiling water. oiling water (98°C) was used in required uantity. The cooling curves of water during eeping and dripping were determined by noting e temperature of water at regular intervals Fig. I) to ascertain the effective temperature and me during the preparation. After cooling and aking up to volume, aliquots (50 c.c.) of the rew were taken to determine the polyphenolic onstituents, as per modified method of Iyengar, atarajan and Bhatia[1]. The polyphenolic constiuents are expressed as chlorogenic acid. The rewing trials were conducted four times and the verage values are given in Table I. Total

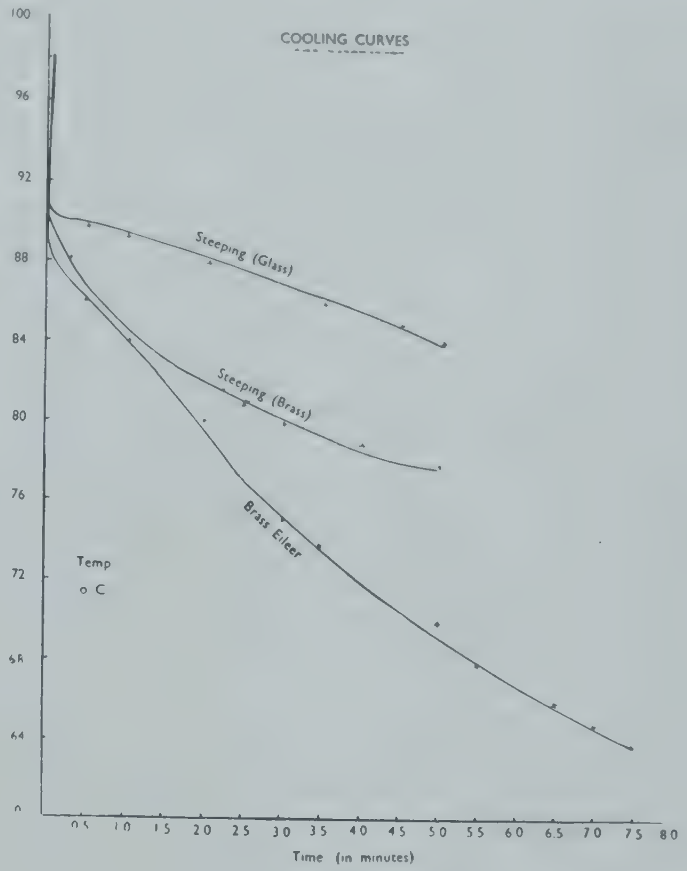

FIG. I. Cooling curves for different methods of extraction.

TABLE I. *Effect of different methods of preparation of brew on the extraction of caffeine and tannin constituents*
(Average of four trials)

Methods	Solids in brew (g/100cc.)	Chlorogenic acid		Caffeine	
		as per cent of solids in brew	% extraction* from powder	as per cent of solids in brew	% extraction† from powder
1. Steeping (5 mts.)...	1.17	16.1	79.1	5.74	97.8
2. Steeping after preheating the container (5 mts.)...	1.17	17.6	83.3	5.74	97.8
3. Drip or filter (10 mts.) ...	1.19	13.6	66.6	5.47	93.4
4. Percolator (5 mts.)	1.01	14.9	62.5	5.57	81.7
5. Vacuum type (5 mts.) ...	1.07	14.2	62.5	...	...

* Caffeine in powder (— 30 mesh 70%): 1.37%; brew 0.067 g/100 cc.

† Chlorogenic acid in powder: 4.80%; brew 0.19 g/100 cc.

OOD SCIENCE FEB. 1958

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soluble solids in brew and chlorogenic acid in coffee powder were also determined. Caffeine in brew was determined by the method of Edward and Nanji[8] and in powder, by the Power and Chestnut method[3].

2. *Effect of the temperature of water used for extraction:* A 5 per cent (w/v) brew was prepared by the steeping method, using water at the temperatures of 98°C, 85°C and 75°C. The temperature was kept constant for 5 minutes in each case. The average values of chlorogenic acid extracted into the brew are given in Table II.

TABLE II. *Effect of temperature on the extraction of tannin constituents*

(Average of four trials)

Steeping temperature (5 minutes)	Solids in brew (g/100 cc.)	Chlorogenic acid	
		in brew (g/100 cc.)	as per cent of solids in brew
95°C	1.24	0.22	17.8
85°C	1.06	0.18	16.9
75°C	1.03	0.17	16.5

3. *Effect of storage of brew at different temperatures:* 100 c.c. of a 5 per cent (w/v) brew were kept in 250 c.c. closed containers of glass, stainless steel, copper, tinned brass and brass at room temperature 28°C and at 70°C. After 6 and 16 hours, the cooled brew in each container was made up to 250 c.c. and aliquots were taken for estimation of chlorogenic acid and caffeine. Trials were also conducted by keeping the brew in a refrigerator.

The ultraviolet absorption curves of the brew (1 in 5,000 dilution) were obtained by measuring the U.V. absorption in the range 400-220 mμ. in a Beckman Spectrophotometer model D.U. for the various samples kept in different containers and at different temperatures. A typical set of curves is given in Figure II.

Results and Discussion

Extraction of tannin-like constituents is influenced both by the method of preparation and the temperature during brewing. Caffeine is more easily extracted than chlorogenic acid (Tables I

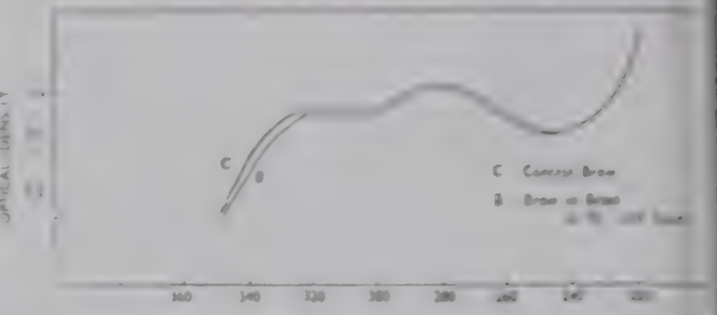

FIG. II. U.V. Absorption curves of Coffee Brew be and after storage at 70°C for 16 hours.

and II). The higher the temperature, the hig is the extraction of chlorogenic acid into the bre In both the steeping and the filter methods, t temperature of boiling water used, drops do by 10°C immediately on pouring into the ve The temperature at the end of 5 minutes steepi is between 90°C and 84°C in glass contai whereas in brass containers the temperature g down to 78°C. At the end of percolation in th filter (7½ minutes), the temperature is 64° The differences in the extraction of the two sol ble constituents in the brew are possibly due t this temperature gradient. Steeping gives highe per cent extractions as compared to the othe methods studied.

Both the tannin-like constituents and caffei are very stable in brew. Even storage of brew higher temperature (70°C) for over 16 hour did not result in loss of the above constituen (Table III). This is corroborated by th insignificant changes observed in the U.V absorption curves (Fig. II) which show peaks a

TABLE III. *Chlorogenic acid, caffeine and U.V. absor of brew after 16 hours' storage at 70°C.*

Container	Temp. (°C)	Optical density* at mμ		Chlorogenic acid in brew (g/100 cc.)	Caffeine in brew (g/100 cc
		280	320		
Control ...	...	0.41	0.35	0.18	0.063
Glass ...	28	0.40	0.35	...	...
Brass ...	,,	0.41	0.34	...	...
Glass ...	70	0.41	0.34	0.18	0.063
Brass ...	,,	0.40	0.33	0.17	0.062

* 1 in 5000 dilution of brew.

20 mμ (chlorogenic acid) and at 280 mμ affeine).

The stability of the tannin-like constituents in offee powders during storage was shown earlier y Natarajan, Iyengar and Bhatia[4]. Trials with r bubbling through brew for varying periods id not also show any change in the tannin-like onstituents.

Summary

1. Extraction of chlorogenic acid from powder during brewing varied from 62.5 per cent to 79.1 per cent in the various methods studied. Steeping method gives the highest extraction.
2. Extraction of caffeine from powder varied from 81.7 per cent to 97.8 per cent in the various methods studied.
3. Tannin-like constituents and caffeine were stable in brew during experimental storage at 28°C and at 70°C.

Acknowledgement

The authors wish to thank Dr V. Subrahmanyan for his kind interest in the work and the Coffee Board under whose auspices this work was conducted.

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GROWTH INHIBITION OF MICRO-ORGANISMS BY COFFEE

By D. S. Johar, C. P. Natarajan and T. N. Ramachandra Rao

(*Central Food Technological Research Institute, Mysore*)

It is generally observed that only moulds grow n coffee brew. Growth of bacteria are not ommon. Crane and Friedlander[1] found that round coffee when mixed with egg yolks, egg hites and chopped beef prevented their decomosition. Dold[2] reported that in a 6 per cent nfusion, *Eberthella typhosa* was killed in 3 days. o other detailed work appears to have been done n the subject. A preliminary study on the rowth inhibiting properties of coffee powder, ecoction, and roast fumes, towards certain acteria and yeasts are reported in this article.

Materials and Methods

Different concentrations of brews from roasted offee powder, spent coffee powder and coffee usk were made in water and after sterilisation n 10 c.c. volumes, were inoculated with a uspension of actively growing organisms as iven in Table I. The growth was observed by oting the turbidity or film formation. The esults are given in Table I. Anaerobes were tudied as per the method of Sreenivasamurthy[3].

Since coffee brew is deficient in sugars a series f trials were conducted using coffee extract alone and coffee extracts fortified with 5-10 per cent sugar, the range corresponding to the one that is normally used in coffee beverage. Sterilised tubes of extracts were inoculated with various organisms and at regular intervals the growth was observed by colony counts using the normal pour plate dilution method. The results are given in Table II. Another series was run using a media in which nutrient broth constituents were dissolved in coffee brew keeping nutrient broth and coffee brew as control. The results are given in Table II. Cultures were also examined after gram staining.

In order to evaluate the growth inhibiting properties of the roasted coffee fumes, the coffee beans were roasted in a closed galvanised iron container. After the chamber was full of fumes, it was cooled and culture plates seeded with *S. aureus*, *E. coli* and bacteria isolated from intestine of the rat (cultures grown at 37°C for 18 hours) were placed in the chamber for 20 minutes and then incubated at 37°C for 24 hours. Inoculated blanks were also run side by side. These trials were repeated a number of times. The typical results are given in Table III.

TABLE I. *Growth of bacteria, yeasts and moulds in Coffee*

Organism	Coffee extract		Dextrose yeast broth	Spent powder 5%	Coffee husk 5%
	5%	10%			
YEASTS					
1. *Zygosaccharomyces japonicus var soya* ...	+	+	+	+	+
2. *Hansenula sub-pelliculosa*	+	+	+	+	+
3. *Dabaryomyces membranaefaciens*	+	+	+	+	+
4. *Torulaspora rosei* ...	+	+	+	0	0
5. *Torulopsis versatalis* ...	+	+	+	0	0
6. *Saccharomyces cerevisiae var ellipsoideus Burgandy*	+	+	+	+	+
7. *Schizosaccharomyces Octosporus*	+	+	+	0	0
8. *Rhodotorula gracilis* ...	+	+	+	0	0
9. *Torula-utilis*	+	+	+	0	0
10. *Endomycopsis selenospora*	+	−	+	0	0
11. *Torula utilis var. major*...	+	+	+	0	0
12. *Ashbya gossypii* ...	+	−	+	0	0

	5% coffee extract with no sugar	5% coffee extract with 10% sugar	Nutrient broth	Spent powder 5%	Coffee husk 5%
MOULDS					
13. *Penicillium notatum* ...	+	+	+	+	+
14. *Aspergillus oryzae* ...	+	+	+	+	+
15. *Aspergillus niger* ...	+	+	+	+	+
BACTERIA					
16. *Bacillus proteus* ...	−	−	+	0	0
17. *Staphylococcus aureus* ...	−	−	+	−	−
18. *Acetic bacteria* ..	−	−	+	...	...
19. *B. coli*	−	−	+	−	−
20. *Leuconostoc mesenteorides*	−	−	+	−	−
21. *Lactobacillus heleveticus*...	−	−	+	0	0
22. *Streptococcus liquefaciens*	−	−	+	0	0
23. *S. faecalis*	−	−	+	0	0
24. *S. paracitrovoru* ...	+	+	+	0	0
25. *Lectobacillus acidophilus*	−	−	+	0	0
26. *L. fermentum* ...	+	+	+	0	0
27. *L. mesenteroides* ...	−	−	+	0	0
28 Caecal flora of rat (anaerobes)	−	−	+	0	0
29. Caecal flora of rat (aerobes)	−	−	+	0	0

(+) shows positive growth (−) shows negative growth or suppression of growth 0 = experiment not conducted.

TABLE II. *Growth of bacteria in coffee media and nutrient broth*

Inoculum 1.4 × 10^6 colonies per c.c. (48 hr. incubator at 37°C)

Media	*B. mesenteroides*	*B. subtilis*	*E. coil*	
Nutrient broth ...	2.7×10^8	5.3×10^8	4.1×10^8	6.7×1
Coffee extract 5% ...	1.4×10^3	2×10^3	1×10^3	4×
" " + sugar 15%	1.2×10^3	2.1×10^3	8.6×10^2	4×
Coffee extract + nutrient broth ...	...	...	2.3×10^6	...
Coffee extract 5% ...	...	...	2.2×10^6	..
Nutrient broth ...	...	...	7.6×10^6	...

TABLE III. *Growth of organisms in roasted fumes*

Organism	Control	Fumigated
1. *S. aureus* ...	Heavy growth all over	central clear area colonies in margin only
2. *E. coli*	Heavy growth all over	"
3. *Intestinal Flora* ...	Heavy growth all over	number of colonies less than control

Results and Discussion

Results in Table I have indicated that the growth of yeasts is not inhibited by coffee, whereas the growth of bacteria in general is suppressed. The inhibition depends on the strength of coffee and the inoculum. Even in the presence of sugar and nutrients the growth of bacteria was inhibited. As one per cent strength of brew did not inhibit growth of *S. aureus* and *E. coli* but indicated a stimulating effect on the mixed intestinal cultures, as shown by the larger size of the colonies as compared to that of the control. Gram staining did not reveal any change in the staining character, except that, the rods and cocci in coffee treated cultures were thinner and showed a greater tendency for chain formation. In 5 per cent coffee extract there was no visible growth or gas formation. The cells of *S. aureus* in this case were swollen and they did not show the usual strong gram positive staining. The gas formers from caecal flora (anaerobes and aerobes) were suppressed by 5 per cent coffee extract. Preliminary trials carried out using the aerobes from intestinal flora of rat in media containing (*i*) brew, (*ii*) brew and milk, (*iii*) brew, milk and sugar, indicated that in the presence of coffee brew, the growth of the gas formers was suppressed.

It is a common belief that vapours from roasted coffee exert, a beneficial effect by controlling the air borne organisms. The cultures of *S. aureus*, *E. coli* and intestinal flora were exposed to the roasted fumes and their growth was suppressed, the effect in the case of intestinal flora being not so pronounced.

In Table III the results showed that only the central portion of the petri dish was acted upon by fumes possibly due to the fact that the portion of media opposite the 2″ diameter vent only was acted on by fumes coming from the vent and not the margin of the plate.

The exact constituents responsible for this inhibition are not yet known. Detailed fractionation studies are necessary in this direction. However, the constitutents responsible for this inhibition are present both in the volatiles and non-volatiles. Among the volatiles, the presence of phenol, resorcinol, cresol, pyridine, guaicol, engeneol, formic acid etc., have been reported.[2] The main inhibitory action may be the combined effect ot these constituents. Presence of compounds which may interfere with the metabolism of these organisms may also be a factor influencing the inhibition.

Acknowledgement

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FREEZING AND COLD STORAGE OF MACKEREL FISH

The west coast of India from the Konkan to the Travancore coast is noted for the mackerel, *Rastrelliger kanagurta*, enormous shoals of which appear during the October-January period. The mackerel fishery is valued at over 40 lakhs of rupees. A substantial percentage of the catches landed at present is not properly utilized due to inadequate supplies of ice and facilities for cold storage, transport and marketing of fish.

With the setting up of ice and cold storage plants at important landing centres, there is a possibility of making available to the people, regular supplies of surplus mackerel throughout the year. Though frozen fish can be kept in good condition for long periods at low temperatures, freezing and subsequent storage may bring about some undesirable changes in texture related to protein denaturation and also off-flavours due to fat oxidation. The present note reports a preliminary study on mackerel subjected to frozen storage.

Fresh fish was eviscerated, washed and then sealed in MSAT cellophane paper. They were stored at—4°F (—20°C) and examined at monthly intervals.

Fish muscle was blended with 5 per cent salt in 0.02M. $NaHCO_3$ according to method described by Dyer *et al.*[1] The blending was carried out in a chill room at 33-35°F to prevent heat denaturation of protein due to rise in temperature during blending. The blended material was spinned for 30 minutes at 2000 r.p.m. in a refrigerated centrifuge. Total nitrogen in the fish muscle and non-protein nitrogen in an aliquot of the filtrate obtained on precipitation of the protein with 5 per cent trichloroacetic acid were determined by Kjeldahl method. Peroxide values were obtained by the method described by Tarr[2]. The results are expressed as ml. of 0.002N $Na_2S_2O_3$ per gram of fat.

For organoleptic evaluation, the fish samples were steamed for 15 minutes and tasted without condiments to find changes in texture, odour and taste.

The important change that took place in the fish muscle during the experimental period was the development of objectionable off-flavour suggestive of fat spoilage. There was not much loss of tenderness or the development of toughness in the fish muscle even after 5 months of storage. The off-flavour appeared after 3 months and was quite pronounced at the end of 5 months. The concomitant development of peroxides and decrease in soluble protein nitrogen are shown in Fig. I. This denaturation may be linked up with rancidity of fat as already suggested by Dyer[3]. The denaturation of the protein might liberate lipids from lipo-proteins and render them more amenable to oxidation.

The development of rancidity in stored mackerel is therefore the principal factor leading to deterioration. The oxidation of fat in frozen mackerel is likely to proceed much more rapidly at higher temperatures under commercial conditions of storage. Further studies are in progress to effectively retard oxidative rancidity during frozen storage of mackerel and other commercial important species of fish both in round and eviscerated forms.

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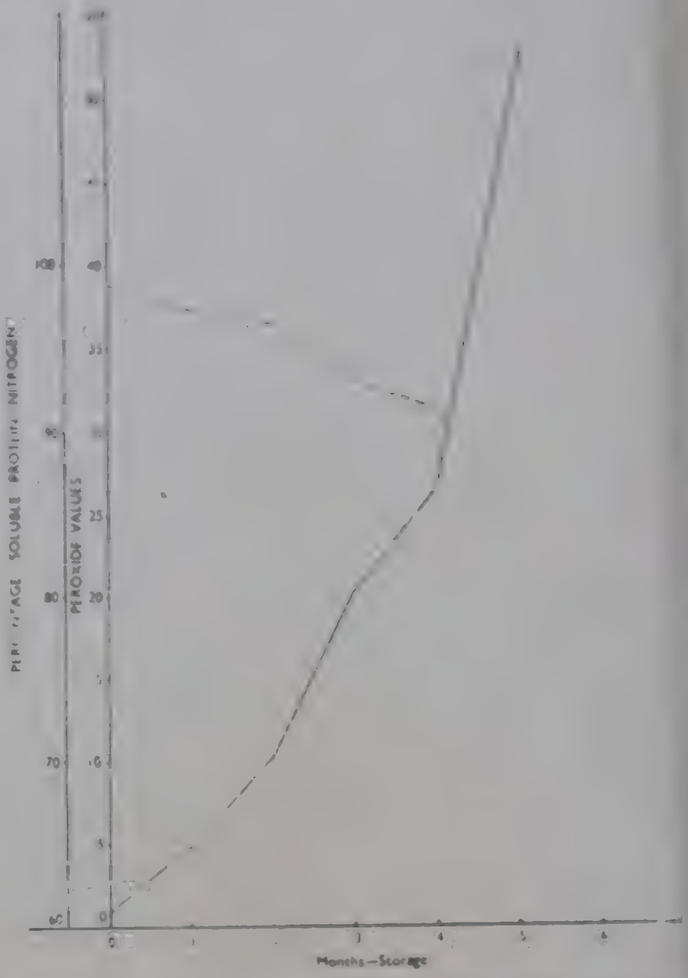

Fig. I. Changes in percentage soluble protein nitrogen (dotted line) and peroxide values of fat (solid line) in mackerel fish stored at − 4°F.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during January, 1958 are given in this section.

S (IS) 4

Development of a colorimetric method for the determination of vanillin, by G. S. Bains and N. S. Kapur, (*January 4, 1958*). Before presenting the results of studies on the vanillin-thiobarbituric acid reaction in dilute systems which formed the basis of a new colorimetric method for the estimation of microgram quantities of vanillin, the speakers referred briefly to the commercial production and extensive use of this flavouring in bakery and confectionery products, and laid emphasis on the scope of its manufacture in the country.

Adverting to the paper, the authors stated that while engaged in studying rancidity in biscuits by the thiobarbituric acid method, it was observed that vanillin reacted readily with thiobarbituric acid at room temperature producing a characteristic yellow coloured complex. As the colour was quite prominent, the possibility of employing this reaction for the quantitative determination of vanillin was considered worthy of an investigation. Information regarding the reaction in dilute systems involving microgram quantities of vanillin, was, however, lacking. As such information was essential for evolving an accurate and sensitive method, the reaction was studied by varying the concentration of different acids, sugars, ethyl alcohol, glycerine, clarifying agents and the stoichiometric proportion of TBA in the reaction system. The intensity of colour produced by known aliquots of vanillin was evaluated by measuring the optical density in the Beckman Spectrophotometer (model DU).

The coloured complex showed a single absorption maximum at 432-434 mμ. Experimental data were presented to illustrate that Beer's law was obeyed at this wave-length within specified limits of vanillin concentration in the reaction system.

It was observed by the authors that the reaction of vanillin with thiobarbituric acid depended mainly upon the relative amount of thiobarbituric acid and the nature and concentration of the mineral and organic acids in the aqueous medium.

The validity of the linear relationship by using a photoelectric colorimeter such as Klett Summerson type equipped with a 440 mμ., filter was shown graphically. The sensitiveness of the method was enhanced in the 0-25 μg/ml. range, when the reaction was carried out in the presence of hydrochloric acid. However, the linear relationship was consistent over a greater range of vanillin, *viz.*, 0-40 μg/ml., when phosphoric acid was employed in the medium in place of hydrochloric acid, but the resulting curve was less steep as compared with the curve obtained by using hydrochloric acid. Therefore, depending upon the amount of vanillin present and the acid used, a photoelectric colorimeter equipped with an appropriate filter could be used for measuring the colour intensity. But the spectrophotometer, is capable of recording correctly the relatively higher optical density when the vanillin content even exceeds the upper limits prescribed for the photoelectric colorimeter.

Referring to application of the method to the estimation of vanillin in vanilla extracts and food stuffs, the authors remarked that interference of sugars was eliminated by extraction of vanillin with ethyl ether. By this procedure satisfactory recovery results were obtained. The speakers concluded by saying that the method is accurate, the coloured complex stable and the relationship between the amount of vanillin and the optical density of the complex under specified conditions, is linear. The limitations of the A.O.A.C. colorimetric method were pointed out.

During the discussion, questions concerning the special features of the proposed method, preparation of vanilla extracts, effect of pH on the reaction, antioxidant properties of vanillin, interference of aldehydes present in alcohol and of caramalised sugar in the estimation, were raised. The President said that although it was not in the purview of our Institute to develop methods of vanillin manufacture yet there was no reason why work on the manufacturing aspect of this important flavourant, preferably from clove oil, should not be taken up. He also stressed the need for introducing vanilla bean cultivation in areas where climatic conditions are favourable. Concluding he suggested that analyses of a large number of commercial brands of vanilla essences and of biscuit and confectionery samples should be done with a view to establishing fully, the use of the new technique and also evaluating the interference of vanillin in the conventional methods of detecting rancidity.

S (IS) 5

Strained foods, by G. S. Siddappa, (*January* 18, 1958). The development of the manufacture of strained foods in America has been amazing. Almost unknown prior to 1930, these foods are now generally accepted as part of the diets of infants, children and invalids. According to the report of the Anglo-American Council on Productivity, the consumption of these foods was to the tune of 1,500 million units even as early as 1952, and it has since been growing rapidly.

Strained foods in general can be broadly classified into three main categories depending upon their acidity. They are:

(1) *High acid group*, the pH not exceeding 3.7-3.8: These do not require any further heat processing after closing the cans. Peach and apricot pulps come in this category. (2) *Medium acid group* with the pH range of 3.8-4.2: The cans require processing in boiling water for varying periods depending upon the nature of the product packed. Apples, tomato products, prunes and mixtures of high acid fruits with cereals, etc., are in this class. (3) *Low acid group*: This comprises of all vegetable packs and products containing meat, cereals, etc. On account of their comparatively high pH range, the canned products have to be processed under pressure at temperatures above 212° F.

The main difference in the treatment of the different categories of products is thus in the heat treatment required after filling and closing the cans. The cans are invariably coated with special lacquer. Other processes like pulping, filling, seaming, etc., are, however, almost the same.

With the object of securing data to serve as a basis for the preparation of a series of strained foods from indigenous fruits and vegetables, 23 well-known brands of strained foods consisting of fruit and vegetable pulps and custards, were analysed for their proximate mineral and vitamin composition. Strained pulps were prepared from fruits like mango, banana, papaya, guava, apple, peach, pineapple, orange, etc., and canned either singly or in combination. For canning strained vegetable pulps, beet root, carrot, squash, white ash gourd, green beans, peas, field beans and cow peas were employed. The method of preparation and packing was standardised in each case. In the case of fruits, they were generally passed through a pulper and a finisher using sieves of 0.03 to 0.01 inch perforation. The fine pulp was filled hot into laçquered cans which were sealed and processed in boiling water. The vegetables were steamed in a retort to ensure complete softening of the tissue and then pulped fine for canning. In the case of fruit custards, the ingredients used were fruit pulp, skim milk powder, sugar, lime juice, cream, egg yolk, corn starch, salt, sodium bicarbonate and vanilla essence. In some of the recipes, the incorporation of cream, egg yolk and essence was optional. The proximate, mineral and vitamin composition of these different products indicated that some of them like strained mango, banana and papaya pulps and mixed mango and papaya pulps; strained peas, beans, carrots and beets; and mango and banana custards are first class strained foods and are very well suited for development.

Since canning of strained foods, which is the conventional method of packing and distributing them is likely to be costly in this country, the alternate method of preparing them in the dried form was investigated in detail. Mango and banana pulps were dried successfully by roller, spray and freeze drying techniques. Vegetable pulps of peas, beans, carrots, beets and squash were dried on roller drier. Mango and banana custards were dried on a double drum drier. The effect of different methods of drying on the ascorbic acid and carotene content of fruit pulps and the water soluble and salt soluble protein fractions of vegetable pulps and custards was determined. The solubility of protein in peas and beans and in mango and banana custards was considerably reduced as a result of roller drying. It is, however, possible that this may not unduly affect their biological value. This, however, requires experimental confirmation. Preliminary work has indicated the possibility of incorporating honey also in the preparation of canned and dried fruit custards.

The dried fruit custard powders were packed in glass, tin and plastic containers and also in air and in nitrogen and their storage behaviour studied in relation to development of peroxide value, Kreis test, caking, off-flavour, etc. Packing in alkathene bags did not prevent caking up. Tin containers with tager top lids which could be sealed hermetically were found to be the best. In the case of pure fruit powders, the placing of an in-package desiccant like calcium oxide was found advantageous. In conclusion, the speaker referred briefly to the economic aspects concerning cost of production and distribution and the necessity for conducting actual consumer acceptance trials and nutritional studies with the canned as well as dried products and pointed out the scope for the development of these new lines of products by the Indian Fruit and Vegetable Preservation Industry.

At the end of the talk, several members, including Madam V. Khouvine Director of the Institute of Biology and Plant Chemistry, Paris, participated in a lively discussion seeking clarification and additional information on certain points. The comparative advantages of glass bottles and tin containers for packing the strained foods in pulp form were discussed. In addition to the packing of strained baby foods, there was much scope for the packing of 'junior foods' also using diced and cubed vegetables. In the case of dehydrated vegetable pulps and custard powders containing added solids, the decrease in the solub of the protein may not unduly aff the biological value of the prote itself. It was pointed out that it desirable to raise the protein leve of the custard powders from abo 9 or 10 per cent to about 12 per ce to enhance their nutritive value This could be easily done witho any technical difficulty. Accordi to Madam Khouvine, the difficult experienced in the fluorimetric estimation of riboflavin in canned custards and custard powders co perhaps be overcome by adopting a simple procedure developed b Japanese workers. In the case o mango powder dried by spray an freeze drying techniques more wor is necessary to get confirmatory data regarding the retention of ascorbic acid and β-carotene. Further work is also necessary to study the role of added gums and of the pulp from the unpeeled mango in facilitating the drying and flavour retention characteristics. As regards the cost of production, it is desirable to collect systematic data by undertaking pilot plant trials. It is also necessary to carry out large scale feeding and consumer's acceptance trials before recommending the processes developed for commercial exploitation.

In his concluding remarks, the Director emphasised the value of fruit pulps in the feeding of infants whose diet is mostly based on milk. The presence of the so-called other carbohydrates was of particular significance in this case. Systematic work should be undertaken to study the effect of feeding infants with milk alone and milk along with fruit pulps. As this problem was of great importance, it called for collaborative efforts at the highest possible level. In this line, the Institute could not only make a positive contribution to the Science of Nutrition but also help in giving a much needed fillip to the Indian Fruit and Vegetable Preservation Industry.

Information and Advice

In pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Preparation and preservation of mango pulp

E (IS) 9

I would like to know the method of preparing and preserving mango pulp and shall be much obliged for the details thereof? (Baroda District).

The process for the manufacture of mango pulp is as follows:

1. Select good quality mangoes and wash them thoroughly and peel straightaway or blanch them and then peel.
2. The pulp is removed from the stone and passed through a sieve of desired mesh or sometimes even through a coarse cloth.
3. Sugar or citric acid are added to adjust the sweetness or sourness desired.
4. The pulp is then preserved by adding chemical preservatives such as potassium metabisulphite to the extent of 1 oz. per 100 lb. or sodium benzoate to the same extent.
5. Instead of preserving by the use of chemical preservatives the mango pulp can also be placed in properly sterilized jars or sanitary tin cans. The containers should be exhausted by heating them to 180-185° F and hermetically sealed. After this, the container is processed in boiling water for a specific time depending on the size of the container. Normally glass bottles require little longer processing than tins. The processing time for the various sizes of tins are as follows:

A 2½ or 30 oz. can—25 minutes
A 1 tall or butter can—18 minutes
12 oz. or 1 lb. jam can—12-15 minutes

After processing, the cans are cooled in running water to room temperature and stored.

6. If the pulp is chemically preserved it can be stored in jars or in properly waxed wooden barrels. Generally the taste of the pulp thus preserved is not as good as the one packed in hermetically sealed tins.

Manufacture of chewing gum

E (IS) 10

Will you kindly furnish us the details regarding the method of manufacture of chewing gum? (Quilon).

The process of manufacturing chewing gum is as follows:

Recipe

Granulated sugar	... 15 lb.
Skimmed milk powder	... 5 lb.
Gum chicle	... 20 lb.
Corn syrup	... 30 lb.
Fine icing sugar	... 30 lb.
Balsam Tolu	... 1 lb.
Oil of Spearmint	... ½ fl. oz.

The gum is crushed into small pieces, melted with a gentle heat and strained through a fine stainless steel sieve to remove extraneous matter. The granulated sugar, corn syrup and milk powder are cooked to 250° F in a kettle. The cooked batch is placed in a heavy duty steel duplex mixing machine, the chicle gum added, then the icing sugar more slowly until the whole mass is thoroughly mixed to a paste. The spearmint is added and, when well distributed, the batch is transferred to a sugar-dusted slab. The mass is cut into conveniently sized slabs of half-inch thickness and passed through a gum rolling, sizing and cutting machine.

Preparation of mustard powder

E (IS) 11

We are preparing and packing powdered mustard in tins and have at present difficulty in obtaining powder free from skin particles. We shall, therefore, be highly obliged if you kindly advise us on the method of completely removing the cuticle from the mustard? (Bombay).

Mustard powder is prepared from yellow or white mustard, *Brassica sinapis alba.* In India yellow mustard seed, commonly known as 'Pilli Sarson' or Bombay mustard, is available. It does not have as good a flavour as yellow or white English mustard, which is noted for exceptionally good flavour. Mustard is thoroughly dried in the sun and passed through iron fluted vertical plates so adjusted that the grain is not crushed to powder. By this treatment the husk is separated from the cotyledons of the mustard seeds, which are then sifted. The sifted mustard is passed through horizontal, fluted, iron rollers having differential speed, i.e., one roller revolves at a higher speed than the other. By this treatment, the cotyledons are crushed into fine particles but the oil does not come out. The powder is suitably packed and marketed.

Flavour in canned mangoes

E (IS) 12

Please write to me as to how mangoes can be canned and stored for a long time without losing its natural taste and flavour? (Kanpur).

The extent of preservation of mango flavour in canned product depends on the careful processing as well as the variety of mango used besides other factors such as quality, maturity, etc. If all the precautions are taken then certain varieties like Alphonso ('Badam' of Mysore) and 'Padri' etc., retain fairly well a good amount of flavour. It is of course not possible to retain 100 per cent natural flavour in any processed food. Perhaps the maximum flavour and freshness would be maintained in frozen fruits only. Therefore, it will be necessary for you to freeze the mango after cutting it and slicing it carefully and mixing it in the desired amount of sugar and packaging it carefully. The freezing temperature should be in the vicinity of —25°F.

Manufacture of orange juice

E (IS) 13

We shall be highly grateful to you if you can kindly send us a detailed formula for the manufacture of superior quality orange juice? (Srinagar).

Good quality oranges are selected and washed carefully.

The fruit is cut into two and the juice is extracted by using revolving burrs or rosettes. Mechanical rosettes are available from Messrs. A. P. V. Engineering Co., Post Box No. 2492 Calcutta. If you want to obtain completely automatic equipment, you may enquire about Kelly's machine.

The juice is filtered through a desired mesh sieve or coarse cloth. This can be done mechanically by using a pulping machine with fine mesh.

The juice is then heated to inactivate the enzymes. At this point the sugar and acid content of the orange juice are also adjusted. This, would, however, depend on the taste of the juice desired by your customers. Normally, the acid is maintained in the vicinity of 0.5-0.6 per cent and the sugar content between 12-15 per cent. The acidity can be determined by titration against sodium hydroxide and the sugar content can be determined by using a refractometer which will give direct reading of soluble solids, corresponding to the sugar percentage. After this, the juice is filled hot into the tin containers at a temperature of 185°F and the container is sealed immediately. After sealing, the container may be pasteurized in boiling water for a period of 10-20 minutes depending upon the size. The large cans are processed for longer period. If you have automatic filling arrangement which will fill the juice at higher temperature it is not necessary to pasteurize the juice. The only precaution needed is to invert the can after sealing. Depending upon the preparation, you may use plain tin cans or Z. R. lacquered cans. The latter will help to preserve the colour of the juice better but has no other advantage. Similarly, the juice can also be filled hot in good quality bottles and pasteurized in boiling water.

Alternatively, the juice can be preserved by adding chemical preservatives such as sodium metabisulphite to the extent of 600 parts per million which would give about 300 p.p.m. of free sulphur dioxide or by using sodium benzoate to the extent of 650 parts per million. Please refer to the Fruit Products Order for the exact specification for the chemical preservatives allowed.

Vinegar pickles

E (IS) 14

What is the method of preparing vinegar pickles? Please inform me about the important products generally made among this variety of pickles? (Hyderabad).

Unlike Indian pickles, Western pickles are usually prepared in vinegar. The most important pickle among vinegar pickles is cucumber pickle invariably known as 'Gherkin' pickle. Next in importance is the onion pickle.

The method of preparation of vinegar pickles consists of steeping the vegetables (cucumber, onion, etc.) in 2-3 per cent salt solution. After the onset of slight fermentation, evidenced by emission of gas bubbles, the salt concentration is raised slowly until it reaches to about 10 per cent salt in the solution. This process takes about 2-3 weeks on the conclusion of which the vegetables become soft, transparent and improve in colour. The salting process is also called as 'curing'. The 'salt stock', as the cured vegetables in 10 per cent salt solution are called, are stocked in vats which are filled upto the brim with salt solution. At the time of the preparation of pickles, the vegetables are soaked in running water to wash away part of the salt content and bottled in 4 per cent acetic acid or vinegar. Such pickles can be kept over long periods free from deleterious microbial growth in them.

Amla syrup

E (IS) 15

Let me know the recipe with complete details regarding the preparation and preservation of amla syrup? (Andhra).

Amla has long held a place of honour in Indian medicine and products made out of it have gone into a variety of preparations, which are largely of the nature of restoratives and tonics. It has, undoubtedly a variety of heat resistant ingredients of therapeutic value but the usefulness of the preparations, it is considered will be further enhanced if its vitamin C content can also be preserved.

Select fully ripe fruit characterized by its palish appearance. Wash the fruit thoroughly in running water to remove dust and other extraneous matter. Steep the fruit in 2 per cent brine for about a week thereby removing the astringent taste of the fruit. Steam the whole fruit in a Pressure Cooker for 15 minutes and place the cooked fruit in 1½ times its quantity of water. Separate the stones from the cooked and split fruits and crush them in a Fruit Juice Extractor (meat mincer type) as quickly as possible. Press out the crushed mass through a cloth obtaining maximum quantity of the juice possible.

Recipe

Amla extract	... 8.5 lb. (Brix 5.8°)
Sugar	... 7.5 lb.

Mix the ingredients thoroughly and filter through a muslin cloth. Preserve the product by the addition of potassium metabisulphite at the rate of 5 grains per lb. of the product or by sodium benzoate at the rate of 8 grains per lb. or by pasteurization at 180-185°F for 30 minutes (12 oz. bottles). If the product is to be packed in cans, processing at 175-180°F for 25 minutes should be done for safe preservation.

Note: For every 1000 ft. rise in the altitude of the place the processing time should be increased by 2 minutes.

Cooling and storage: In the case of pasteurized syrup in cans, the product should be cooled in running cold water, and in the case of syrup preserved in bottles with preservatives, the product may be stored in a cool dry place. Storage trials have shown that the product could be kept in its normal conditions for more than 8 months.

Preservation of grape juice

E (IS) 16

How is grape juice prepared and preserved? I shall be highly thankful to you for the details about the process? (Bangalore).

Good quality grapes are selected and washed thoroughly. The grapes are heated in a steam jacketted stainless steel pan until they become soft. The softened fruit is strained through a coarse heavy cloth or passed through a fine pulping machine. The juice is filtered through a cloth a second time if necessary. At this stage acid and sugar contents may be adjusted to suit the taste, although generally not necessary.

The juice is filled in large glass containers and kept in a cold room preferably under refrigeration. This allows titration to settle down. After that the juice is decanted off and filtered. It is heated to 190°F and filled in glass bottles and pasteurized. The bottles are sealed (crown corked) and pasteurized in boiling water. Time of pasteurization depends upon the size of the bottle. 4-5 oz. bottles are pasteurized for 15 minutes and larger bottles up to half-an-hour. This juice can also be preserved with the addition of sodium benzoate to the extent of 600 p.p.m. (Kindly refer Fruit Products Order 1955 for exact specification of preservatives).

Notes and News

STATISTICAL NOTES

Production Statistics for November and December, 1957

Name of Industry	No. of units	Production during November 1957	No. of Units	Production during December 1957
Confectionery ...	38	968 tons	35	883 tons
Biscuits	33	1,539 ,,	31	1,083 ,,
Flour milling ...	42	58,011 ,,	41	54,303 ,,
Butter (tinned) ...	7	204 ,,	6	219 ,,
Cashewnuts ...	19	2,788 ,,	15	1,691 ,,
Dal and gram flour ...	2	815 ,,	2	785 ,,
Aerated water ...	37	54,162 gross bottles	35	41,171 gross bottles
Beer	2	72,321 bulk gallons	2	114,073 bulk gallons
Country spirit	23	360,888 L.P. gallons	19	459,194 L.P. gallons
Indian made foreign liquor	17	65,856 bulk gallons	15	57,393 bulk gallons

(*Ministry of Commerce and Industry, Government of India*)

NEWS BRIEFS

Manufacture of Vitamins: A number of schemes for the manufacture of vitamins have been approved by the Government of India. Two of the schemes are for the manufacture of synthetic vitamin A from lemongrass oil which is available in the country. Each of these schemes envisages an annual production of 10 million mega units of vitamin A valued at Rs 50 lakhs.

The production of shark liver oil which is rich in vitamin A has more than doubled during the last two years; about 59,500 gallons valued at about Rs 14.3 lakhs were produced in 1956 as against 27,158 gallons valued at over Rs 6.5 lakhs produced in 1955. Shark oil is produced by three Government factories in Bombay, Kozhikode and Trivandrum.

A licence has been granted to a firm under the (*Industries Development and Regulation Act*) for the manufacture of 1.2 kg. of vitamin B$_{12}$ per year valued at Rs 12.37 lakhs. Production is expected to commence by March 1958.

Another scheme submitted by a firm for the manufacture of vitamins B$_1$, B$_2$, B$_6$, C and D is now under consideration. The question of producing some of these vitamins by the National Industrial Development Corporation is also being examined.

Licences have also been issued to two firms for the production of nicotinic acid and nicotinamide. The capacity will be about 15 tons per year. One of the firms has already gone into production (*Res. and Ind.*, Sept. 1957, p. 252).

Storage life of cashew kernels: Licences for the commercial development of processes on improving the storage life of cashew kernels (**Indian Patents 49838** and **53319**) have been issued to Kerala Produce Exporting Co., Quilon; and Urban Stanislaus and Co., Quilon.

These processes have been developed at the C.F.T.R.I., Mysore. (*Res. and Ind.*, Sept. 1957, p. 254).

DRAFT INDIAN STANDARDS

Suji (or Rava): The draft Indian Standard Specification for *Suji* or *Rava* (Samolina) specifies the requirements both physical and chemical. These requirements cover particle size, microscopic appearance, moisture, total ash, acid insoluble ash, fat, acidity, etc.

In the preparation of this draft standard, consideration has been given to the data on the composition of *Suji* as manufactured from different varieties of wheat produced in the country and imported from abroad. Due weightage has also been given to the relevant rules issued by the Government of India under the Prevention of Food Adulteration Act, 1954. (*ISI Bull.*, July 1957, p. 181).

Biscuits: The draft Specification for biscuits lays down requirements applicable to all types of biscuits which would act as the basis for determining the wholesomeness of these products and their freedom from likely deleterious contaminations.

In this draft standard, it has been specified that biscuits shall be well baked but shall not bear signs of scorching. They shall be crisp and of uniform texture. Designs on them, if any, shall be clear. They shall have an agreeable odour, typical of well baked biscuits and shall be free from off odour, soapy or other off taste, and free from insect and fungus infestation. In addition to such physical characteristics, there are certain chemical requirements which have also been prescribed in the draft standard. These chemical requirements are for maximum percentage limits for moisture, acid insoluble ash, etc., and minimum limit for fat content. A chemical test for determining whether the biscuits have gone rancid or not has also been specified. All these chemical requirements will safeguard against the unwholesomeness of biscuits, for example, the percentage moisture content will reflect upon the crispness, acid insoluble, ash on grittiness and so on. (*ISI Bull.*, Sept. 1957, p. 219).

NEW INDIAN STANDARDS

Glucose: Two Indian Standard Specifications covering the following subjects have recently been published:

(1) Liquid Glucose (IS: 873-1956).

(2) Dextrose Monohydrate (IS: 874-1956).

India's glucose industry is in an infant stage. It is under the protection of the Tariff Commission. Therefore, while formulating these standards, the I.S.I. has fully kept in view the difficulties which present themselves to the young indigenous industry, but, at the same time, the materials conforming to them would be compatible to products from overseas countries.

Liquid glucose is a very thick syrupy material. It is extensively used in the confectionery, biscuit and food canning industries and to a limited extent in textile, leather and paper industries.

Dextrose monohydrate is manufactured either in the crystalline form or in the powder form and is very largely used as a food for the young and convalescents.

The specification for liquid glucose covers three grades of the material, namely low conversion (LC), medium conversion (MC) and high conversion (HC), which are based on the degree of hydrolysis of starch. For dextrose monohydrate only one grade of the material has been prescribed.

These standards, besides detailing the requirements for colour, moisture, dextrose, etc., and limits for harmful metallic and other impurities, also contain methods of sampling and test for the materials. (*ISI Bull.*, Sept. 1957, p. 215).

PATENTS

Indian

57822. *Improvements in spray drying:* By spraying the material in a drying medium in a spray drier wherein the said medium is recirculated.—Patented by Shri Ram Institute for Industrial Research (*Res. and Ind.*, Sept. 1957, p. 258).

58807. *Improvements in human dietary preparations:* Comprising a pulverulent water-dispersible assimilable protein of low bulk density and a stable assimilable bland fat absorbed in said protein.—Patented by Glaxo Laboratories, Ltd. (*Res. and Ind.*, Sept. 1957, p. 258).

Foreign

778627. *Preserving fruit:* Citrus fruit, such as oranges, grape fruit, lemons and tangerines are subjected to the action of a phenolic mould inhibitor having normally a tendency to burn the surface of the fruit, together with sufficient of a non-ionic surface agent to reduce this tendency.—Patented by Monsanto Chemicals Ltd. (*Food Trade Rev.*, Sept. 1957, 38).

779560. *Canning:* Relates to a process of canning green vegetables wherein the canning liquor employed comprises an aqueous solution of chlorophyllin containing a neutral salt of *l*-ascorbic acid.—Patented by The Allen Chlorophyll Co. Ltd. (*Food Trade Rev.*, Sept. 1957, p. 38).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

The chemical composition and nutritive value of groundnut (peanut) and its products, by Venkata Rao, S. and Jogi Pantulu, A., *Indian Oilseeds J.*, 1957, **1** (5), 322.—Groundnut is a rich source of protein, fat and B-vitamins. The kernels are used in the preparation of salted nuts, candies, peanut butter and vegetable milk. The low fat groundnut flour has been utilized in several ways. In this article, the AA have reviewed the literature available on the chemical composition and nutritive value of groundnut and the products that can be processed from it. The chemical composition of the kernels with the range of values for each constituent has been given. It is found that the kernel contains on an average about 48 per cent oil and 28 per cent protein. Groundnut protein is made up of mainly two globulins, *viz.*, arachin and conarachin present in the ratio of 4:1. The essential amino acid make up of the protein has been given in a table, along with those of egg, cow's milk, soyabean and cottonseed proteins. It is seen that peanut protein is a good source of 8 of the 10 essential amino acids and is deficient only in methionine and lysine. The peanut protein has good growth promoting value (comparable to casein) and supplementary value. The digestibility of the protein is 89 per cent. The fatty acid composition of the groundnut oil has been compared with that of butter fat and vanaspati. The groundnut oil is as easily digestible as animal fats. The amounts of different carbohydrates, vitamins and minerals present in the kernels have been referred to. It is found that the major sugar present is sucrose to the extent of 2-5 per cent of the kernels and the kernels are a good source of some of the B-vitamins. Reference has been made about the conditions which have been standardised for the preparation of properly balanced and fortified groundnut milk whose composition and nutritive value compares with that of cow's milk. The process of manufacture of peanut butter has also been given and its composition compared with that of butter from cow's milk. Peanut butter being a very rich source of protein, is a more nourishing diet than the butter from cow's milk. A method for the preparation of low fat edible groundnut flour is referred to and its chemical composition has been given along with those of bengalgram flour, skim milk powder and several other low fat oilseed flours. The low fat peanut flour has a good biological value and has been used in developing several nutritious products such as soup powder, Mysore flour, composite grains, low-cost malt food, multipurpose food and enriched biscuits. 70 references have been listed. K.L.R.

A note on 'blown' or 'swelled' cans by Lal, G. and Ranganna, S., *Indian Food Packer*, 1957, **11** (9), 16.—This general article deals with spoilage of canned products *viz.*, cans with bulged ends which are classified as 'flippers', 'springers' or 'hard swells'. This type of spoilage is caused due to the development of internal pressure in the can. The swells are of two kinds (1) Biological swells and (2) Hydrogen Swells.

The classification of biological swells on the basis of acidity of the foodstuffs and the remedial measures are given. Hydrogen swells are formed as a result of the formation of hydrogen following the internal corrosion of the can. A few fruits and vegetables have been classified according to their corrosive activity. Various causes which accelerate corrosion have been given along with remedial measures to check internal corrosion of the can.

L.N.S.

Water for fruit and vegetable processing plants, by Lal, G. and Ranganna, S., *Indian Food Packer*, 1957, **11** (10), 7.—This general article deals with the quality of water required for food processing plants generally termed 'potable water'. The physical, chemical and microbiological characteristics of drinking or potable water are discussed.

Characteristics of water required in the fruit and vegetable processing plants for different processes, *viz.*, for general purpose, for canning, for soft fruit drinks and carbonated beverages, washing of citrus fruits, manufacture of fruit acids and pectin for bottle washers, keg washers and pasteurizers have been given. Treatment of water for use in fruit and vegetable processing plants have been briefly stated.

L.N.S.

Treatment of cannery effluents, by Lal, G. and Parekh, C. M. *Indian Food Packer*, 1957, **11** (10), 21.—Cannery waste can be classified into four groups namely cooling tank water, ensilage stack seepage, gross solids, factory waste or process water. Various treatments have been suggested to remove suspended organic material before disposal of the waste.

Screening of the cannery waste by (*a*) Rotary drum screen (*b*) vibrating table type screens (*c*) gyrating circular-type screens, have been mentioned.

Additional treatments of cannery effluents of food processing plants which are not located in the municipal boundaries, have been described. These additional treatments are (*a*) chemical treatments (*b*) biological treatments (*c*) lagooning (*d*) aeration-flotation process and (*e*) clarifiers. Disposal of treated effluents and soild waste has also been described. L.N.S.

The relative value of the proteins of Indian Multipurpose food. Bengalgram (*cicer arietinum*) **and skimmed milk powder in meeting the protein requirements of protein-depleted animals,** by Kantha Joseph, *et al.*, *Ann. Biochem. exptl. Med.*, 1957, **17** (4), 103.—Several foodstuffs rich in protein could be used for the treatment of protein malnutrition which is widely prevalent in many countries. The AA have investigated into the relative efficiency of such products *viz.*, Indian Multipurpose Food, bengalgram and skim milk powder in providing the protein requirements of protein-depleted animals. Four groups of rats were fed for three weeks on rice gruel equivalent to 3 g. of rice per rat per day. The calorie and protein intakes were far below the actual requirements of the rats. After the feeding periods, one group of rats were sacrified and their body composition was determined. This data served as control for later experiments with experimental diets. The three remaining groups of protein-depleted rats were fed for 21 days on experimental diets based on multipurpose food, bengalgram and skim milk powder respectively. The percentage of protein provided in all the three diets was 14 and the levels of Ca, thiamine and riboflavin were also made equal. The urine and faeces were collected and preserved. The food intake and nitrogen contents of the diet, urine and faeces were determined. The animals were sacrificed after three weeks and their body composition determined. The results show that (1) the control group (protein-depleted) of rats contain a higher percentage of moisture and lower percentage of all solids as compared with the experimental animals (2) retention of nitrogen was greater in rats fed on skim milk powder than in rats fed on Multipurpose Food and Bengalgram (3) the increase in weight of rats was maximum in rats fed skim milk powder (4) the body-water content of rats fed on the bengalgram diet was greater than that observed in the other two diets and (5) the increase in cell solids of the rats fed either skim milk powder or Multipurpose Food was slightly greater than in rats fed on bengalgram diet. The above findings indicate that the ability of the different foods in providing the protein requirements of the rats ranged in the descending order of skim milk powder, Multipurpose Food and bengalgram. K.L.R.

Effect of processing on the trypsin inhibitor in jackfruit seed (*Artocarpus integrifolia*), by Siddappa, G. S., *J. sci. industr. Res.*, 1957, **16C** (10), 199.—Raw jack seed contains a powerful trypsin inhibitor which can be extracted with phosphate buffer or dilute hydrochloric acid. The activity of the extract is destroyed completely by autoclaving it for about 30 minutes and also by boiling the seeds in water or salt solution, or by baking.

Spin-Pasteurization: A new approach to the preservation of citrus concentrates, by Pruthi, J. S., *Indian Food Packer*, 1957, **11** (5-6), 11.—In view of the restricted distribution of frozen foods in Australia and India and the objectionable flavour of sulphited concentrates, an investigation was carried out on the effects of 'Spin-Pasteurizing' citrus concentrates. A specially designed spin cooker was used, in which the cans rotate round their axes when placed on a moving belt at an inclined angle. It was concluded that with the spin cooking-cooling, higher processing temperatures could be used without scorching or overcooking the product, there was increased retention of colour, flavour and nutritive value of the product and a wider range of processing times and temperatures were available for different degrees of concentration and in several can sizes. Preliminary trials indicate that the spin cooker could be adapted for the processing of delicately flavoured and soft textured fruit products such as mangoes and orange segments in syrup. L.N.S.

Further studies on red tamarind, by Lewis, Y. S., Dwarakanath, C. T. and Johar, D. S., *Curr. Sci.*, 1957, **26**, (12), 394.—The AA had shown earlier that the red pigment in the red tamarind fruit was due to the presence of the anthocyanin and chrysantherium, while the commoner variety of tamarind contained a colourless leucoanthoryamin. The AA have now investigated into the origin of the pigmentation in the flowers and have studied the chemical composition of the ripe fruits. It was found that all parts of the pistil and the staminal sheath and filaments of the flower of red variety were all bright red in colour while the flowers of the commoner variety did not show any colouration either in androeceum or in the gynaeceum. The pigmentation starts only at a later stage during the maturity of the flowers and not in the early stages. The colour develops at two regions in the pistil *viz.*, basal portion of the style and at base of the ovary. The pigment diffuses to all parts of the ovary as the flower fully matures. The clean pulp of ripe fruits of the two varieties was used for the chemical analysis. The results show that the red variety of tamarind contains a higher proportion of combined tartaric acid while the commoner variety has a higher free tartaric acid content. This is also borne out by the higher ash percentage in the former. The low free acid content of the red variety reasonably accounts for its being reputedly 'sweeter'. The combined acid is mostly due to potassium tartrate and calcium tartrate. The red tamarind has also a higher pectin content than the commoner variety. K.L.R.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Trypsin inhibitors in Indian foodstuffs: Part IV—Effect of double bean (*faba vulgaris* Moench) **Trypsin inhibitor on the** *in vitro* **digestion of proteins by trypsin** by Usha Apte and Kamala Sohonie, *J. sci. industr. Res.* 1957 **16C** (12), 225.—The trypsin-inhibitor present in double bean has been shown to markedly affect the rate of tryptic hydrolysis of proteins of skim milk and wheat flour. The release of some amino acids is selectively inhibited; the inhibition gradually decreases with the progress of digestion. The purified inhibitor fed to rats at 0.265 per cent level of the diet does not, however, inhibit their growth.

Physico-chemical investigations on indigenous seed proteins: Part III—Amino acid composition of sesame seed globulins by Nath R., Hanumantha Rao, K and Giri, K. V., *J. sci. industr. Res.*, 1957, **16C** (12), 228.—The protein fractions isolated electrophoretically from sesame seed meal have been quantitatively analysed for their amino acid contents by circular paper chromatographic technique.

The globulin fractions contain more of the sulphur-bearing amino acids, cystine and methionine and the basic amino acids arginine, histidine and lysine than the whole meal. Serine, proline, glutamic acid and aspartic acid have been estimated for the first time in all the globular fractions and meal.

The site of the enzyme system involved in the biosynthesis of ascorbic acid, by Chatterjee, I. B., *et al*, *Sci. and Cult.*, 1958, **23** (7), 382.—It has been shown earlier by the AA that incubation of a homogenate or an extract of the liver tissue of the rat, mouse, rabbit and goat with D-glucuronolactone in presence of cyanide results in a marked synthesis of ascorbic acid. *In vitro* synthesis of ascorbic acid from D-glucuronolactone by different fractions of the goat liver extract under the influence of cyanide has shown that the microsomal fraction is the main site of the maximum enzymic activity. The supernatant fraction has no stimulatory but rather an inhibitory effect on the synthesis. With the increase in the concentration of microsomes in the fraction, the amount of ascorbic acid synthesised also increases proportionally. No increase in ascorbic acid could be observed in the absence of cyanide. It has, however, been found that the microsomal fraction can convert L-gulonolactone in L-ascorbic acid with or without cyanide. Sodium salt of D-glucuronic acid as well as L-gulonic acid is not converted into ascorbic acid under the above conditions.

K.L.R.

FRUIT AND VEGETABLE PRODUCTS

Average bacterial load in vegetables at different stages during canning, by Dutt, J. M. A. and Bose A. N., *J. sci. industr. Res.*, 1957, **16C** (12), 241.—The initial bacterial count and the number of spores present in the material to be canned have an important bearing on the processing time. The AA have carried out bacterial load determinations during the actual manufacture of canned potatoes, cabbage and peas in a cannery in Calcutta. Samples of the vegetable at different stages of pretreatment before canning were taken out aseptically and kept in a refrigerator until required for bacterial count-examination. Each sample was minced in a sterile waring blender and a weighed portion of the blended material was transferred to a conical flask containing a definite amount of sterile water. The flask was shaken well and the supernatant liquid was examined for bacterial count by dilution and plating method. The average bacterial load of the raw, peeled or depodded, blanched and exhausted vegetables have been given in a table. In the case of potato, it is found that its peel carries a very heavy load of bacteria which can be reduced by peeling. Blanching and exhausting further reduce the number of bacteria. Higher bacterial load was observed in blanched and exhausted cabbage as well as pea, which may be due to the presence of high heat resistant bacteria.

K.L.R.

Some aspects of food canning: 4—Operation of retorts, by Littlejohn, *Indian Food Packer*, 1957, **11** (9), 13.—Low acid foods form an ideal medium for bacterial growth and unlike acid foods which are sterilized by the combined effect of heat and acid, they must be sterilized by the action of heat alone. In order to achieve this, foodstuffs are cooked under steam pressure in retorts which will easily provide temperatures of 240°-250°F.

Two types of retorts *viz.*, horizontal and vertical can be used for the purpose. Horizontal retorts may be of several types, *viz.*, batch-type stationary retorts, agitating retorts, non-agitating retorts etc. Normally, agitating retorts are used for foodstuffs, particularly milk products.

The components of the retorts and the services including the operation of the retorts and the precautions to be taken during operation and the need for altitude correction are briefly outlined.

L.N.S.

OILS AND FATS

Stability of vanaspati containing different proportions of hydrogenated palm, linseed and mustard oils blended with hydrogenated groundnut, oil, by Roy, B. R. and Guha, B. C., *J. sci. industr. Res.*, 1957, **16C** (12), 231.—The stability of vanaspati made up of a mixture of hydrogenated groundnut oil and hydrogenated red palm, linseed or mustard oils in varying proportions has been investigated and compared with that of hydrogenated groundnut oil under different storage conditions.

When stored in sealed tins, vanaspati samples containing different proportions of mustard oil do not exhibit any difference in their peroxide and acid values. In samples containing linseed oil, the peroxide value rises markedly with higher proportions of linseed oil in the blend whereas only a slight increase is observed in acid value. Higher proportions of palm oil increase the acid value of the samples markedly but the peroxide value varies only slightly.

In samples stored in loose cover cans, higher proportions of linseed and mustard oils induce more peroxide formation whereas higher proportions of palm oil reduce it. A slight increase in acid value is observed in all samples, the increase being directly proportional to the proportion of the oils present in the sample.

Ethyl gallate suppresses peroxide formation markedly and acid value slightly in most cases.

Vitamin A is more stable in samples containing more of palm oil than in vanaspati made of groundnut oil alone but its stability is lower in samples containing linseed or mustard oil.

Stability of Vitamin A in vanaspati enriched with vanitin, by Roy, B. R. and Guha, B. C., *J. sci. industr. Res.*, 1957, **16C** (12), 236.—The stability of vitamin A acetate in vanaspati enriched with Vanitin (Hoffmann-La Roche) used under different conditions of storage has been studied. The loss of vitamin A in the stored samples is rapid in the early stages after which it slows down. The protection afforded by the addition of ethyl and prophyl gallates, nordihydroguaiaretic acid (N.D.G.A.), butylated hydroxyanisole (B.H.A.) and Tenox II (Eastman Kodak) is not appreciable in loose-cover cans.

Heating enriched vanaspati at 110°-50°C. for 2 minutes does not result in a great loss of vitamin A, but heating at higher temperatures (200°-250°C) for longer periods (5 minutes) causes considerable loss.

During cooking there is appreciable loss of vitamin A particularly when the same vanaspati is used for preparing successive batches of food. B.H.A. offers some protection to vitamin A in the process of cooking.

Antibacterial activity of some Indian inedible vegetable oils, by Bhat, S. G., Kane, J. G. and Sreenivasan, A., *Indian Oilseeds J.*, 1957, **1** (5), 298.—Several vegetable oils have been used in Indian medicinal system in the treatment of skin diseases and leprosy because of their therapeutic properties. Much work has been done on the isolation of the constituents from some of the oils with a view to fix up components responsible for the bactericidal action. The AA have, in this investigation, studied the antibacterial tests of *neem*, *karanja*, *Malkanbuni* and *undi* oils and their alcohol extracts and molecularly distilled fractions by following three different methods *viz.*, (*i*) the agar-cup assay of Heatley modified by Schmid and Moyer, (2) the agar-streak assay of Waksman and Reilly and (3) the serial dilution assay of Foster and Woodruff. Two typical gram-positive bacteria *Micrococcus pyogenes* var. *aureus* and *M. albus*, *Escherichi acoli*, the typical gram-negative organism and several other pathogenic organisms were employed as test organisms to evaluate the antibacterial activity. *Undi oil*, its alcohol extract and molecularly distilled fraction show a definite antibacterial property only against gram-positive organisms but was effective against *E. coli*. The results with other oils are of conflicting nature in the three different methods employed and no concrete conclusion can therefore be arrived at in evaluating their antibacterial action. In the case of *undi* oil, the alcohol extract was 14 times more active against *M. aureus* than the original oil and the fraction distilling between 180-220°C during molecular distillation shows maximum activity.

K.L.R.

The fat requirement of cattle and the nutritive value of oilcakes, by Kehar, N. D., *Indian Oilseeds J.*, 1957, **1** (5), 303.— is extracted from the oilseeds by the bullock-drawn *ghani*, power driven expeller and solvent extraction methods resulting in oilcakes containing a varying percentage of residual oil in them. These oilcakes constitute the main source of supply of fat in the ration of cattle. The A reviews in brief the work carried out in detail at the Indian Veterinary Research Institute on the following aspects: (1) fat requirements of adult non-producing bullocks, growing calves and milch cows; (2) comparative nutritive value of rations containing oilcakes obtained in the *ghani*, expeller and solvent methods and the chemical composition of the cakes during storage, (3) the effect of feeding the cakes processed by the three methods on growth, milk and butter fat production and (4) comparative nutritive value of cottonseed and its cake and their effect on milk and butter fat production. Details of the above investigations have been brought out in the form of a monograph.

K.L.R.

Studies on the refining of vegetable oils: Part I—Use of chemicals in refining by Krishna Rao, V. V. and Murthi, K. S., *Indian Oilseeds J.*, 1957, **1** (5), 315.—Considerable loss of oil recurs during the refining of crude oil with alkali. The extent of loss depends on the nature and amount of impurities present in the crude oil. Addition of an aliphatic acid such as citric or tartaric acid or inorganic salts (electrolytes) before adding alkali considerably reduces the refining loss. Several polar and non-polar chemicals have been used for the same purpose and many of these methods are covered by patents. The AA have studied the effect of adding at various concentrations chemicals *viz.*, phosphone, salicytic, citric, tartaric and oxalic acids, oxalic acid in combination with sodium carbonate and tetra sodium pyrophosphate in the refining stage on the amount of oil lost. Three samples each of crude groundnut oil and crude cottonseed oil produced in expeller mills have been used. The results have been presented in different tables. It is found that in the case of almost all the chemicals, there is a decrease in the refining to varying degrees. The chemicals are more effective in reducing the loss in the case of groundnut oil (reduction of refining loss varying from 10.8 to 42.3 per cent) than those of cottonseed oil (from 8.0 to 20.5 per cent). This indicates that the reduction of refining loss is specific with the particular chemical and oil at least to some extent. Comparison of the bleached oil colours of the refined oils obtained with and without the addition of the chemicals shows that there is no difference in these colours. The chemicals do not contribute to the reduction of the colour of the oils during the refining

K.L.R.

Studies on the Indian rice bran and rice bran oil—I., by Rao, G. V., Murthi, K. S. and Chandrasekharan, K., *Indian Oilseeds J.*, 1957, **1** (5), 339.—The AA have studied the composition and characteristics of some of the varieties of rice bran and its oil. The most important factor to be taken into consideration in the extraction of oil is the enzymatic activity of lipase present in the bran resulting in the degradation of glycerides into free fatty acid (F.F.A.). This activity ceases once the oil is separated from the bran. A sample of freshly milled rice bran was stored at room temperature in an air-tight tin container over a period of 100 days and the F.F.A. contents of the oil were determined at different intervals. The F.F.A. content of the oil which was 3 per cent to start with in the fresh bran, rose up to 62.5 per cent over a period of 100 days. The oil content of the bran was almost constant while the moisture content increased from 8.2 to 10.5 per cent. A sample of the oil extracted from the fresh bran and stored for about 90 days showed a rise from 8.17 to 8.44 per cent in the F.F.A. contents. The oil extracted from the bran is quite stable and it is better to extract the oil while the bran is fresh. Data on the analysis of 50 samples of rice bran from 16 varieties of rice milled in various districts of Andhra State for moisture, oil and F.F.A. contents of the oil have been tabulated. It is found that the moisture varies from 4.4 to 12.5 per cent, the oil content from 12.3 to 23.1 per cent on moisture free basis and the F.F.A. of the oil from 3 per cent in fresh samples to 78 per cent in samples received several days after milling. The protein contents of six of the above samples of rice bran shows a variation from 12.9-14.4 per cent. The extracted bran oil was dewaxed by chilling and its characteristics are reported. The dewaxed oil was refined, the loss of oil in refining being 40.7 per cent and the F.F.A. of the refined oil was 0.12 per cent. The refined oil was bleached with 4 per cent activated earth and 0.4 per cent activated carbon and the colours of the refined and bleached oils were determined with a Lovibond Tintometer using $\frac{1}{4}''$ cell. The extraction rates of rice bran with four different solvents *viz.*, alcohol, hexane, pegasol and S.B.P. spirit (Burmah Shell) have been studied. The results represented on a graph show that alcohol has a comparatively lower extraction rate and pegasol a higher extraction rate than others. Physical properties of the solvents are given.

K.L.R.

SPICES

Black mould of garlic (*Allium sativum L*), by Mathur, R. L. and Mathur, B. L., *Sci. & Cult.*, 1958, **23** (7), 372.—Earlier workers had isolated the fungus *Aspergillus* from decaying Italian garlic and the presence of *Aspergillus alliaceus* Thom and Church on garlic entering U. S. ports from Italy has been mentioned in the literature. There is, however, no report, about the organism responsible for the black mould normally found on mature garlic bulbs in India. The AA have studied this disease which is characterised by the formation of black powdery mass between the bulb scales and the surface of the bulbs. Pure culture of the fungus was obtained from the diseased bulbs and was grown on Czapek's dextrose agar medium. The morphological characters of the culture have been noted. This reveals that the fungus isolated from garlic is *Aspergillus niger* van Tieghem which is quite different from *Aspergillus alliaceus* Thom and Church reported by earlier workers. The presence of *Aspergillus niger* has been further proved by sterilizing healthy garlic bulbs with 0.1 per cent $HgCl_2$ solution and then spraying with a suspension of conidia of the fungus, when black mould was observed after some days. The black mould disease can be controlled by storing the bulb in a dry and airy place and sorting out the affected bulbs at regular intervals.

K.L.R.

GENERAL

Studies on tamarind seeds: Part I—Grey yarn sizing with tamarind kernel powder, by Bhat S. G., *J. sci. industr. Res.*, 1957, **16A** (12), 563.—Sizing trials performed on grey yarn sized with tamarind kernel powder (T.K.P.), defatted T.K.P., washed T.K.P. and starch indicate that T.K.P. is comparable to starch with respect to increase in tensile strength; only about half the quantity of T.K.P. is required to give the same sizing effect as starch. Defatting is not essential for the use of T.K.P. in sizing, as the oil naturally present in the powder imparts softness to yarn during weaving or knitting.

The use of sodium chlorite and ammonium sulphate under suitable conditions completely desizes yarn sized with T.K.P. resulting in simultaneous bleaching.

Polyose depolymerase and Polyose glycosidase activity of

tamarind leaves, by Savur, G. R., *J. Indian chem. Soc. Industr. and News Ed.*, 1957, **20** (2), 55.—Tamarind leaves contain two distinct enzymes designated as *Polyose Depolymerase, P.D.* which reduces the viscosity of polyose solution without cleavage of the glycosidic bonds and *Polyose Glycosidase, P.G.*, which increases the reducing power of polyose solution without appreciable increase in viscosity. The properties of P.D. and P.G. are characterised.

Polyose depolymerase and glycosidase activity of moulds, by Savur, G. R., *J. Indian chem. Soc. Industr. and News Ed.*, 1957, **20** (2), 62.—Although tamarind polyose is not hydrolysed by pectic enzymes and is not depolymerised appreciably in the presence of alkalies, the viscosity of the polyose solution can be reduced without cleavage of glycosidic bonds by an enzyme designated as polyose depolymerase, P.D., whereas Polyose Glycosidase, P.G., is another enzyme which increases the reducing power or polyose solution without considerable change in viscosity. Both P.D. and P.G. have been characterised.

PART III (Foreign)

ANALYTICAL

Determination of nitrogen in barley and malt, by Heron, J. R., *J. Inst. Brewing*, 1957, **63,** (4), 339.—Errors due to fractionation when weighing out ground samples of barley and malt have been investigated. Coarser particles of barley have a higher nitrogen content, and fractionating should be avoided when weighing. The reverse applies to malt, the coarser particles containing less nitrogen. Although a fine grind tends to exaggerate nitrogen differences in malt, fractionation is easier to avoid and fine grinding is preferable for both barley and malt.

Determination of vitamin A by conversion to anhydrovitamin A, by Budowski, P. and Bondi, A., *Analyst*, 1957, **82** (980), 751.—Vitamin A may be converted to anhydrovitamin A in benzene solution at room temperature, in the presence of toluene-p-sulphonic acid as a catalyst. The increase in extinction at 399 mu, which results from the dehydration, is proportional to the amount of vitamin A present and can be used for the determination of this vitamin in unsaponifiable extracts. The method exhibits a high degree of specificity and has been applied to a variety of products, including vitamin-A concentrates, fish oils, margarine, butter and poultry mashes, without further purification of the unsaponifiable extracts.

BIOCHEMISTRY AND NUTRITION

Methionine and lysine supplementation of animal feeds, by Rosenberg, H. R., *J. agric. Fd. Chem.*, 1957, **5**(9), 694.—Methionine or lysine is the first limiting essential amino acid in commercial mixed feeds. Successful supplementation of a feed consists of adding the first limiting essential amino acids to the feed in such a manner as to achieve a balance with the second limiting essential amino acid as any amount in excess of that needed for proper balance is lost. Whether or not all of the first limiting essential amino acids needed to obtain balance can be utilized depends upon the energy content of the diet which regulates feed consumption.

The amino acid content of wheat flour and bread, by Hepburn, F. N., *et al.*, *Cereal chem.*, 1957, **34** (5), 312.—Methods are presented for the analysis of the eighteen commonly occurring amino acids in wheat and wheat products. Acid hydrolysis under dilute conditions minimized the destructive influence of carbohydrate. Barium hydroxide hydrolysis followed by precipitation of the barium as carbonate was the most satisfactory method for the determination of tryptophan.

Results of microbiological assays are presented for a pilot study on four blends of hard red wheat, the flours milled from them, and the breads prepared from the flours. The amino acid composition of the proteins of two commercial blends of hard red spring wheat and two of hard red winter wheat was nearly constant. Similarly, the amino acid distribution within the protein of the flours commercially milled from these wheats tended to be equal, even though the degree of refinement ranged from 98.5 to 80 per cent patent. The protein of the bread samples also showed constancy in composition, as would be expected, since the flours were subjected to the same treatment in the preparation of bread.

Statistically significant differences in the proportions of certain amino acids were found between the proteins of wheat and flour and between those of flour and bread. The levels of the following amino acids were significantly decreased by the average amounts indicated: in the conversion of wheat to flour, lysine 24 per cent, arginine 19 per cent, aspartic acid 19 per cent, glycine 17 per cent, alanine 14 per cent, threonine 7 per cent, and tryptophan 6 per cent; in the manufacture of bread from flour, cystine 11 per cent, glutamic acid 8 per cent, arginine 6 per cent, proline 5 per cent, and tryptophan 5 per cent. At the same time, the proportions of the following amino acids were significantly increased: in the milling of wheat into flour, glutamic acid 21 per cent, proline 19 per cent phenylalanine 11 per cent, isoleucine 9 per cent, leucine 8 per cent, serine 8 per cent, cystine 7 per cent, and tyrosine 5 per cent; in the conversion of flour into bread, lysine 19 per cent, aspartic acid 11 per cent, methionine 10 per cent, threonine 7 per cent, and valine 3 per cent.

Differences in the amino acid composition of wheat and flour are attributed to a fractionation of the wheat proteins during milling. Differences in the amino acid levels of flour and bread resulted from the inclusion of milk and yeast in the bread formula and from the baking process itself.

Growth of rabbits on purified diets, by Hove, E. L. and Herndon, J. F., *J. Nutr.*, 1957, **63** (2), 193.—For growth of rabbits fed a simple purified diet, defatted soybean meal was superior to casein as a protein source. With 20 per cent casein the rate of growth was about 15 gm/ day. Soybean meal as the sole source of protein at an equivalent level permitted growth of about 30 gm/ day. This compared favourably with growth of 35 gm/ day for rabbits on a commercial feed. A supplement of arginine, glycine and tryptophan improved growth of rabbits fed the casein diet, and accounted for a part of the soybean meal effect. Other deficiencies in casein, as yet unidentified, were corrected by soybean meal or by dried brewers' yeast.

The type of carbohydrate in the diet had a minor effect on rabbit growth. Sucrose, starch, gum arabic, agar, cellulose and triacetin were compared. Gum arabic and agar influenced the growth rates most favourably.

Vitamin content of foods exposed to ionizing radiations, by Ziporin, Z. Z., Kraybill, H. F. and Thach, H. J., *J. Nutr.*, 1957, **63** (2), 201.—In 8 foods analysed, namely, haddock, beef, turkey, ham (fresh) bacon, peaches, powdered milk and beets, turkey showed a significant decrease in riboflavin, while the niacin content was reduced in peaches. Thiamine was destroyed to the extent of 70 to 95 per cent in all foods tested except powdered milk.

Comparison of these results with results previously published indicates that vitamins in foods are less radio-sensitive than those in pure solution.

The degradation of thiamine occurs by the splitting of the molecule into pyrimidine and thiazole moieties. The thiazole undergoes further degradative changes at higher doses of irradiation.

Nutritive value and safety of hydrogenated vegetable fats as evaluated by long-term feeding experiments with rats, by Alfin-Slater, R. B., *et al.*, *J. Nutr.*, 1957, **63** (2), 241.—A multigeneration study in which rats have been fed a ration containing 9.24 per cent of a selectively hydrogenated vegetable oil as practically the sole source of fat in the diet has now been carried through 46 generations. The performances of rats of generations 26 through 46 as judged by gain in weight, tibita length, reproduction, lactation, longevity and carcass analyses have shown that the hydrogenated fats are of full nutritional value. The presence of 6.9 per cent essential fatty acids (expressed as linoleic acid) in the hydrogenated vegetable fat has been shown to be sufficient to maintain normal plasma and liver cholesterol levels and liver lipid levels in the rat. The test animals in the multigeneration studies ingested per unit of body weight about 10 times as much trans-fatty acid isomers as would be ingested by the human on a diet with all the visible fats in the form of the selectively hydrogenated vegetable oils. In the case of the longevity studies, this ratio was as high as 30:1. Hydrogenation of margarine fats does not produce excessive saturated fatty acids and indeed the essential fatty acid content of the hydrogenated margarine oil can be relatively high. Attention has been directed to the relatively saturated fat deposited in the body of animals on low fat diets, even those containing limpid vegetable oils rich in essential fatty acid content.

Previous experiments on generations one through 25 of this multigeneration study have yielded beneficial results on metabolism studies, digestibility studies and histopathological examination of the tissues in addition to the nutritional indices mentioned above. In other studies, the fatty acid isomers contained in the hydrogenated fats exhibited no measurable antimetabolite activity toward the essential fatty acids despite an average of about 7:1 in the ratio of trans-isomers to biologically active fatty acid content.

It is therefore concluded that selectively hydrogenated vegetable oils, such as are employed in margarine manufacture, containing positional and stereoisomers of the unsaturated fatty acids, are fully digestible, harmless, and of full nutritional value as determined by long-term studies conducted with rats. In all the multigeneration and longevity studies, herein reported, no deleterious effects were observed as a result of the ingestion of the small amounts of saturated fatty acids present in the hydrogenated fats.

Leaf protein as a human food, by Pirie, N. W., *Food Manuf.* 1957, 32 (8), 416.—The author and his colleagues who have extracted leaf protein at Rothamsted Experimental Station have found it an acceptable food. They offer experimental supplies to any food industry which can find a use for it.

Details have been given of a two-unit arrangement *viz.*, an extension machinery unit, which can handle green materials at rates of from 0.5-2.0 tons per hour and of an equipment to separate the protein and get it into a useable state. Ultimately, the author hopes to make a single unit that will pulp and press in one operation. One ton of fresh leaf containing 82 per cent of water gives an yield of 100 lb. moist protein which carries with it 5-10 per cent of lipids. The drying of the protein, either in air at room temperature or on heated rollers or freeze drying has been discussed. The nutritive value of leaf protein which is a mixture of a very large number of different proteins has also been elaborated upon. The author envisages a future course of research on the value of leaf protein as human food, on designing an extraction unit better adapted for use by a village or small town and on the study of suitable vegetation in various localities.

B.V.S.

CEREALS

Cooking quality of 26 varieties of milled white rice, by Batcher, O. M., Deary, P. A. and Dawson, E. H., *Cereal Chem.*, 1957, **34** (4), 277.—The cooking qualities of 26 varieties or selections of milled white rice were evaluated by some objective measurements of physical and chemical characteristics of the rice and by palatability tests. Variety and environment as well as grain type influenced cooking quality. Long-grain varieties of rice tended to absorb more water than the other grain types, although there were exceptions. Variations in starch and total solids in the residual cooking liquids were apparently due to varietal factors, although the production source of the variety may have been an influencing factor. Highly significant correlations were found among some of the objective measurements and palatability evaluations. With a larger number of varieties, the possibility of developing equations for predicting some palatability characteristics of rice from the objective measurements seems promising.

Composition of the protein of whole maize seeds by Wolfe, M. and Fowden, L., *Cereal Chem.*, 1957, **34** (4), 286.—The complete amino acid composition of the protein of seven varieties of maize seed has been determined. In order to reduce analytical errors due to losses of amino acids occurring during protein hydrolysis by mineral acids, protein fractions, representative of the total seed protein complements were isolated and purified before subsequent hydrolysis. Amino acids present in the hydrolysates were estimated by a quantitative paper chromatographic technique.

Considerable differences occurred in the amino acid composition of the protein present in different varieties of maize seed, the largest differences being found for arginine, histidine, kysine, leucine, threonine, valine, and amide-nitrogen. The differences of protein composition tended to be greatest between varieties genetically most distantly related. These differences were not due to variations in the proportions of zein in the various seed proteins.

FERMENTATION

Continuous fermentation—alcoholic fermentation of blackstrap molasses, by Borzani, W. and Aquarone E., *J. agric. Fd. Chem.*, 1957, **5** (8), 611.—The influence of sugar concentration, feed rate, agitator speed, and fermentor capacity on the continuous alcoholic fermentation of blackstrap molasses has been studied on a pilot-plant scale. The sugar concentration and the fermentation-cycle time can be related by an equation, theoretically justified, if it is assumed that the sugar consumption has a reaction rate of − 1. Agitation is probably the rate-determining factor for continuous alcoholic fermentation. Penicillin increases the efficiency by preventing contamination. After 30 hours of fermentation, the penicillin concentration was 25 to 60 per cent of the initial antibiotic concentration. Laboratory and plant-scale fermentations with 1.0 unit per ml. of penicillin were studied and found favourable. An increase in the alcohol yield (4.8 to 19.5 per cent) and a reduction of the acid production (17.0 to 66.6 per cent) was observed. Penicillin did not affect the final yeast count or the fermentation time, and Leuconostoc contamination was inhibited by 8.0 units per ml.

FRUIT AND VEGETABLE PRODUCTS

The carotenoids of tangerines, by Curl, A. L. and Bailey, G. F., *J. agri. Fd. chem.*, 1957, **5** (8), 605.—The carotenoids in tangerine peel and pulp (fruit flesh) have been fractionated by countercurrent distribution, followed by chromatography. Factors contributing to the redder colour of the tangerine, as compared to the orange, were much higher concentrations of cryptoxanthin (pulp and peel), β-carotene (pulp) and a hydroxy-canthaxanthinlike substance (peel). Minor constituents not previously reported from oranges included lycopene, γ-carotenelike and hydroxycanthaxanthinlike fractions from the pulp, and lycopene and a rubixanthinlike fraction from the peel. A minor phytofluenelike band was found on chromatography on the column between α-carotene and β-carotene, in both pulp and peel carotenoids.

Amino-acids in nine frozen vegetables, by Murphy, D. M., *et al.*, *J. agric. Fd. chem.*, 1957, **5** (8), 608.—Ten amino acids (arginine, histidine, isoleucine, leucine, lysine methionine, phenylalanine, threonine, tryptophan, and valine) were determined on composites of 102 sets of samples, representing 1953 and 1954 production seasons for nine frozen vegetables. Sample packages were taken from commercial processing lines of freezing plants in all United States production areas. Samplings were performed at statistically predetermined intervals to provide representative samples.

The isolation and identification of hydroxy-methylfurfural from stored canned plum syrup, by Parkinson, T. L. and Barker, C. J., *J. Sci. Fd. Agric.*, 1957, **8** (11), 639.—Examination of the ultraviolet absorption spectrum of canned and bottled plum syrup showed that a new compound formed during storage, particularly at 37°. This substance has been extracted with ether, separated by paper chromatography and identified as hydroxy-methylfurfural. Chlorogenic acid and its isomer, isochlorogenic acid, were also extracted by ether; hydroxymethylfurfural has been separated from the chlorogenic acids by the use of an ion-exchange resin, and also by countercurrent distribution.

Occurrence and activity of some lactic acid bacteria from apple juices, ciders and perries, by Carr, J. G., *J. Inst. Brewing*, 1957, **63** (5), 436.—Some of the lactic acid bacteria of apple juices, ciders and perries have been examined with a view to establishing the following; their relationship with similar organisms from other beverages and the effect of their growth in ciders. These organisms could be divided into three main groups, namely, heterofermentative cocci, heterofermentative rods and homofermentative rods, representatives of the first two groups being the most frequently encountered. Members of all three groups may be responsible for the malo-lactic fermentation. Some members of the group of heterofermentative rods are mainly responsible for the disorder of ropiness, while the activities of the remaining organisms may be either beneficial or deleterious according to the pH and nutritional status of the ciders in which they grow.

Freeze-drying of fruit by Jackson, S., Suzanne L. Rickter, and Chinchester, C.O., *Food Technol.*, 1957, **11** (9), 468.—Peaches were torque-pitted, lyepeeled, and freeze dried under vacuum. Four methods of heat transfer were investigated: single, double plate, infra-red and dielectric heating. A Stokes freeze-drier was used for the first three heating methods. Heating plates controlled by auto-transformers were used for contact heating. Heat lamps whose output was controlled and measured were used for infra-red heating. Dielectric heating experiments were conducted in a glass vacuum chamber contained within a commercial dielectric heater. Drying rates were measured and compared for the four methods of heating.

Time-Temperature Tolerance of Frozen Foods: VIII.—Organoleptic evaluation of frozen strawberries, raspberries and peaches, by Guadagni, D. G., *Food Technol.*, 1957, **11** (9), 471.—A simple concept for the organoleptic evaluation of food products held at various temperatures is described. Procedure involves use of an objective-type difference test such as the triangle to compare samples held at experimental temperatures against controls maintained at a temperature low enough to prevent deteriorative changes. Percentages of correct responses obtained in such a test are then plotted against time and the resulting curve provides information with regard to the rate and relative magnitude of the changes occurring at various temperatures. The curve obtained in this way also allows for comparison of results at any given probability level. Data are presented to show the effect of temperature and the reproducibility of the method over long periods of time. With commercial retail samples of frozen strawberries, raspberries and peaches, it was found that 70 to 85 per cent correct judgements gave more accurate and reproducible results than the percentage corresponding to a 5 per cent level of significance.

INSECTICIDES

Colorimetric method for the determination of cyclethrin, by Sweeney, J. P. and Williams, H. L., *J. agric. Fd. chem.*, 1957, **5** (9) 670.—The synthesis of cyclethrin, a pyrethrin-type insecticide, has presented a need for a sensitive and precise method for its determination. Both pyrethrins and cyclethrin, when heated with reagents containing orthophosphoric acid, react to produce red colours having maximum absorbance from 545 to 550 mu. However, the cyclethrin colour reaction differs from that of pyrethrins in respect to the composition of the colour-producing reagent, the length of heating time necessary for the production of maximum colour, and the stability of the colour complex to heat. The cyclethrin colour is suppressed by piperonyl butoxide and by sulfoxide. However, these substances can be separated from cyclethrin by chromatography. The method described is applicable to the determination of as little as 10 γ of cyclethrin.

Mercury residues in sprayed crops. I.—Tomatoes, by Beidas, A. S. and Higgons, D. J., *J. Sci. Fd. Agric.*, 1957, **8** (10), 597.—Mercury residues have been determined on glasshouse crops of tomatoes which have been treated with mercury aerosols. The results show that in some cases 0.5 p.p.m. (as metallic mercury) may be present on the fruit as it is harvested. The mercury contamination is situated mainly in the pulp of the tomato and is a potential health hazard to the consumer.

STORAGE

The storage of groundnuts under tropical conditions. I.—The effects of prolonged storage on undecorticated and decorticated groundnuts, by Duerden J. C. and Cutler, J. R., *J. Sci. Fd. Agric.*, 1957. **8** (10), 600.—In a study of the extent of insect damage and determination of quality of groundnuts stored in sacks for 16 months in a warehouse in N. Nigeria, there was found little difference between undecorticated, hand-shelled and 'pestle-and-mortar'-shelled nuts, in the loss of weight and production of powder, as a result of attack by insects (mainly *Tribolium castaneum*) but there were large differences in the build-up of free fatty acids. The insects are shown to cause breakage of the nuts, but under the conditions of the experiment an unbroken shell provides complete protection of the kernels against the species used.

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COMPOSITION OF COFFEE BREW

By C. P. Natarajan, D. S. Bhatia, N. Gopalakrishna Rao, C. S. Viraktamath
R. Balakrishnan Nair and K. M. Narayanan
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The constituents in the coffee brew have not o far been clearly defined. Kaufman[1] reported hat 'in the extract of the roasted product soluble offee, we cannot account for more than 30 per ent in terms of known chemicals and of this naccountable portion, about 20 per cent or wo thirds is ash'. The complex nature of the hanges that take place during roasting may ccount for the difficulty in classifying in chemical erms all the constituents of the brew. This ubject has been under study in these laboratories or some time and the results so far obtained are eported here.

Materials and Methods

Plantation 'A' coffee was roasted in a coffee oaster to a medium roast and a 10 per cent w/v rew was prepared by steeping coffee powder in oiling water for 5 minutes. After filtering, he brew was made upto 500 c.c.

The colour of the powder was determined in Photovolt Reflection Meter—Model 610, using he search unit 610 Y and tristimulus filters. The 'Y' reading with the green filter was 5, ndicating that the colour corresponded to that f medium roast powder.

The various constituents *viz.*, total solids, caffeine, chlorogenic acid, ash, total nitrogen, total sugars and colour, were estimated in the brews and these estimations were done in duplicate on duplicate extracts. Typical average results are presented in Table I. Caffeine was estimated by the modified method of Edwards and Nanji[2] and chlorogenic acid by the method of Iyengar, Natarajan and Bhatia[3]. The reducing sugars and invert sugars were determined by Lane Eynon method. Total sugars were estimated by hydrolysing under reflux with 1 N HCl for 3 hours at 98° C. To the value of total sugars estimated, the percentage of fructose obtained from invert sugar estimation was added since fructose is destroyed at the temperature of hydrolysis. Ash and total solids were determined by standard methods.

In a series of trials, the alcohol precipitable matter in brew and the filtrate obtained therefrom were also analysed. 100 c.c. of the brew was concentrated to 25 c.c. and 10 volumes of alcohol were added slowly, by continuous stirring to precipitate the polysaccharides (preliminary trials having indicated that the maximum precipitation occurred with 10 volumes of alcohol). After settling for 10-12 hours, the precipitate was centrifuged and washed number of times with alcohol. All washings were collected and after removing the alcohol, it was made upto volume for analysis. The alcohol precipitate was dissolved back in water, filtered and made to volume. Since the alcohol precipitate did not go into solution completely, the residue was weighed separately.

It was also observed that on concentration of the brew some water insoluble matter appeared and it was weighed. The results are given in Table I.

After many trials, it was found that the basic lead acetate precipitate retained all the colour and that the colour could be extracted in acidified acetone. The acetone was evaporated off and the

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TABLE I. *Chemical composition of coffee brew**

	Brew (a)†	Constituents as % of solids	Alcohol ppt. (b)†	Alcohol filtrate (c)†	(b) + (c)	Water insoluble residue (d)†
1. Total Solids ...	2.140	...	0.530	1.510	2.04	0.110
2. Caffeine ...	0.094	4.4	...	0.094	0.094	
3. Chlorogenic acid ...	0.300	14.0	0.050	0.250	0.300	
4. Proteins (non-caffeine N×6.25) ...	0.300	14.0	0.090	0.200	0.290	
5. Total sugars (as glucose) ...	0.470	21.9	0.190	0.280	0.470	
6. Ash ...	0.310	14.5	0.110	0.210	0.320	
7. Colouring matter ‡ ...	0.330	15.4	0.050	0.270	0.310	
	1.804	84.2	0.490	1.304	1.794	
8. Organic acids other than chlorogenic acid (Mabrouk and Deathrage) ...	0.165	7.7			0.165 (calculated)	
Total ...	1.969	91.9			1.959	0.110=2.069=96.31

* Brew is 10% w/v

† Data expressed in g.|100cc.

‡ Crude colouring matter (acetone extract) 0.85g.

Ash	0.11	0.52g.
Chlorogenic acid ...	0.24	
Protein N×6.25 ...	0.11	
Sugars	0.06	
Colouring matter (by difference) ...		0.33g.

total extractable matter was determined. Ash, nitrogen, chlorogenic acid and sugars were estimated in this extract. From the total extract, the chlorogenic acid, ash, protein (N×6.25) and sugars were subtracted to get the residual weight which has been designated as *colouring matters.* Caffeine is not precipitated by lead acetate. *Reproducible results were obtained by the above procedure.* The distribution of the colouring matters between the alcohol precipitate and the filtrate was also studied. The nature of the colouring matter remains, however, a subject for further study.

Results and Discussion

From the data in Table I, it is seen that major constituents in coffee brew have been estimated. By separating the alcohol insolubles and analysing the precipitate as well as the filtrate, the composition of the brew solids has been confirmed. It is observed that the alcohol precipitate is not completely soluble in water and the water insolubles are about 25 per cent of its weight. It has also been noticed that, on concentration, a precipitate appears in the brew, and has the following composition: ash 27 per cent; total sugars 31 per cent; unhydrolysed residue (98°C—3 hrs. with 1 N HCl)—20 per cent and crude protein (N×6.25)—2 per cent. The polysaccharide has been shown to contain Galacoose, arabinose and mannose[4]. It is likely that a portion of the highly polymerised polysaccharide becomes insoluble while concentrating the brew as indicated by the analyses of the insoluble residue (31 per cent sugars).

For want of a suitable method, it has not so far been possible to indicate the amount of colouring matters present in the brew. In an indirect way, the amount of colouring matters has now been estimated in the brew. Colour, in general, is considered as caramel. Our preliminary experiments have indicated that the coffee colour is made up of different compounds, since the tinctorial power of caramel (from cane sugar) at the level found in the brew is far less than that of the actual colour of the brew. The colouring matter in the brew cannot be taken up completely in solvents like petroleum ether, ethyl acetate, amyl alcohol, chloroform etc. Further studies are required to elucidate the nature of the colouring matters in the brew.

Mabrouk and Deathrage[5] have reported the presence of citric acid, malic acid, caffeic acid, tartaric acid, acetic acid, pyruvic acid and oxalic acids, besides chlorogenic acid. These acids constitute about 24.6 per cent of the total solids in brew. Acids other than chlorogenic acid are present to the extent of 7.7 per cent. These were not estimated in our studies and taking the values reported by the above authors, the constituents present in brew works out to 91.9 per cent of the total solids. However, the combined analyses of the alcohol precipitate and the filtrate as shown in Table I accounted for nearly all the solids.

The changes in the various constituents in brew as influenced by the degree of roasting are being studied.

Summary

The chemical composition of coffee brew has been ascertained. A 10 per cent w/v brew on an average contains 2.14 g. of soluble solids. The composition of this soluble solid is as follows: caffeine 4.4 per cent; chlorogenic acid 14 per cent; crude protein 14 per cent; total sugars 21.9 per cent; ash 14.5 per cent and colouring matters 15.4 per cent.

Acknowledgement

The authors' grateful thanks are due to Dr V. Subrahmanyan, Director, for his kind interest in the work and to the Coffee Board under whose auspices the work was undertaken.

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EFFECT OF INSECT INFESTATION ON THE COMPOSITION OF JOWAR (Sorghum vulgare)

Jowar (*Sorghum vulgare*) is one of the important food grains cultivated widely in different parts of India. During 1956—57 the quantity of jowar produced in India amounted to 7.4 million tons.[1] Jowar is more easily susceptible to damage by insects during storage than other cereals and millets. Besides lowering the market value of the grain, insect infestation is also likely to affect the nutritive value and hygienic condition of the grain[2, 3]. No information is available in the literature regarding the changes in the quality of jowar infested by insects. It was therefore considered desirable to investigate the effect of infestation of jowar by *Calandra oryzae* L., (a common insect pest of jowar) on the kernel damage and hygienic quality of the grain.

Clean, uninfested jowar obtained within one month of harvest was stored in 5 lb. lots in jute bags of size 1′ × 1′. The grain had an initial moisture content of 12.5 per cent and a viability of 87 per cent. Half the number of bags were infested by *Calandra oryzae* L by letting 5 pairs of the insect in each bag. The rest of the bags were kept free from insect infestation in separate rooms. The bags were kept in chambers maintained at a temperature of 85 ± 5°F and a relative humidity of 70-75 per cent. At monthly intervals two bags from the infested and control lots were removed for analysis. The changes occurring in the grain as a result of insect infestation were assessed according to the methods described in the earlier investigations[2, 3].

The results are presented in Tables I and II. Since *Calandra oryzae* L bores through the grain keeping the outer shape intact, a marked decrease in the weight/volume ratio is observed with the increase in infestation as revealed by the insect population and kernel damage. The loss in viability indicates that the insect while boring through the grain, damages the germ portion also.

Table II shows the unhygienic condition of the stored jowar at different stages of infestation. The uric acid content, which serves as a measure of the insect excreta present in the grain, was determined in the powdered grain after the infested samples were cleaned of insects and dust over a sieve.

TABLE I. *Population of C. oryzae and the extent of loss in weight and viability of the stored jowar*

Period of infestation (months)	Loss in weight %	Weight/volume ratio g/cc.	Insect population per 500 g.	Kernel damage %	Viability %
1	0.9	0.857	...	...	85
2	3.2	0.825	88	10.5	60
3	4.8	0.810	275	12.8	54
4	22.5	0.670	4100	36.0	18
5	31.5	0.590	7650	61.3	5
Insect free grain at the end of 5 months' storage	...	0.857	...	...	87

TABLE II. *The effect of infestation by C. oryzae on the hygienic conditions of stored jowar*

Period of infestation (months)	Insect fragments per 100 g of grain	Impurities (g.) per 5 lbs of grain	Uric acid mg/100 g
1	...	...	1.0
2	450	2.7	2.8
3	600	9.7	10.6
4	1200	59.9	61.7
5	2300	125.0	73.0
Insect free grain at the end of 5 months' storage	...	...	...

It will be seen that the uric acid content of infested jowar is found to increase with the increase in insect population and kernel damage. Further uric acid content of the infested jowar serves as a good index of the unhygienic condition of the grain due to the presence of insect excreta. These results are in conformity with earlier observations with wheat[3], Bengal gram and field bean[4]. It will be observed that with the increase in the insect number, the insect fragment count in the grain also increases. The grain infested for a period of 4 months presented a dirty appearance and developed an undesirable off-flavour as a result of accumulation of insect excreta and mould growth. Organoleptic evaluation showed that unleavened bread prepared from the flour obtained from the grain infested for a period of 3 months was acceptable to habitual jowar eaters. It could therefore be concluded that jowar with a kernel damage of about 12 per cent and uric acid content of 10 mg per cent due to insect infestation might be considered still acceptable to the average consumers. The grain which had undergone damage to a greater extent was, however, not acceptable.

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MANUFACTURE OF MALT AND MALT PRODUCTS

By M. Narayana Rao, M. R. Chandrasekhara, M. Swaminathan and
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Malt is the product obtained by the germination of cereal grains and drying them under controlled conditions. Grains are usually malted primarily to develop or activate enzyme systems such as amylases which are important in subsequent commercial uses of malt. Malt is essentially an intermediate rather than a terminal product and requires further processing by industries utilizing it for the preparation of finished products. Very large quantities of malt are being used nowadays for the manufacture of beer and also in the preparation of malt extracts and malt sugar for incorporation in infant and invalid foods[1]. The several uses of malt, for the preparation of food and beverage products depend chiefly on the enzyme activity, starch content and flavour. The present review gives a brief account of the methods employed for the manufacture of malt, malt extract and dextrimaltose powder.

Raw materials

Barley, wheat, rye, ragi (*Eleusine coracana*) and jowar (*Sorghum vulgare*) have been used as raw materials for malting in different countries[1-7]. The different grains when malted produce both α and β amylases in relatively large amounts which result in more rapid and complete hydrolysis of starch to dextrins and sugars. The most commonly used raw material for making malt in different countries is barley, which gives a malt of higher amylase activity than other grains[2]. In addition, the barley grain, as compared to other grains is very well suited for preparing malt because of its inherent characteristics. Barley is one of the few grains in which the hulls are cemented to the kernel and are firmly attached even after threshing. During early stages of germination the young sprout (acrospire) grows up under the hull and is protected from injury by commercial malting operations resulting in more uniform germination of all kernels.

Principles of malting

Since most of the malt produced, goes into products for human consumption, it is important that the incoming grain be separated from dirt, weed seeds and seeds of other grains before being stored. Freshly harvested grains often show dormancy and low uneven germination. During storage, the grains attain an uniform moisture content which contributes to uniformity of steeping.

Steeping: Generally the temperature of steeping for barley is 55-60° F and the period is 2 to 3 days.[2] In the case of ragi and jowar, Indian workers[3-8] have generally employed a temperature of 70-85°F for steeping during a period of 24 hours. Often a small amount of lime is added to the first steep water to inhibit fungus growth and to leach out some of the undesirable constituents of the hulls of the grains.

The rate of water absorption and time of steeping are influenced by temperature, size and physical texture of the kernel of the grain[2]. By steeping to an optimum moisture content of 44-45 per cent, uniform germination of the desired type results. Frequent changes of steep water and vigorous aeration are required to prevent loss of germinating ability. With vigorous aeration, germination may start in the steep or in the couch following steeping and thus shorten the total time for the malting process.

Germination: Conditions essential for germination are optimum moisture content, temperature, adequate oxygen supply and sufficient time. While germination is initiated at approximately 25 per cent moisture, higher levels of moisture (44-45 per cent) are necessary for uniformity of germination. Relatively low germination temperatures are required to reduce the loss of dry material through respiration and growth of rootlets and sprouts and still bring about the desired physical and chemical changes. The optimum range of temperatures used during

2

germination is 60-80° F for barley and 70-90° F for ragi and jowar[3, 4]. The temperature increases due to the heat of respiration and germination, during the first day or two of germination. The malt is then cooled by spreading and maintaining at the optimum temperature of 60-80° F until germination is complete. The physical and chemical changes that take place during germination are a continuation and extension of those started during steeping. Early in the process proteolytic enzymes are elaborated and become distributed throughout the kernel.[9] These enzymes appear to be important in the release of the amylases and other enzymes from inactive combinations with proteins. During germination most of the bound β-amylase is freed and both the α- and β- amylases are elaborated by synthesis.[8, 10, 11]. The period of germination depends on the temperature of germination and nature of the grain and usually varies between 4-8 days.

Kilning or drying: Kilning or drying gradually stops germination, but some gradual development of enzymes and hydrolysis of constituents continues during the initial stages of kilning or drying process. At later stages of kilning or drying, chemical changes take place resulting in the development of compounds which impart the characteristic aroma and flavour to kilned malt. In kilning, the development of flavour must be balanced against the destruction of enzymic activity. The use of extended high temperatures, especially at higher moisture contents, increases the malt flavour, but results in deeper malt colours and greater enzyme destruction[2].

Commercial malting

The flow sheet of the malting process is given in Fig. I. Commercial malting requires extensive equipment for the several steps of the process.

Cleaning of the grain: The incoming barley is cleaned to remove weed seeds, other grain, broken kernels, chaff and dust. Several types of equipment designed for removal of the contaminating material are used. In modern plants a complicated and well planned system of elevators and conveyors permits great flexibility in the handling of the grain.

Barley or other grain
(storage)
Cleaner → dust, chaff and weed seeds
Grader → undersized kernels
Steep tank
Compartment type germination
Compartment type malt drying kiln
Malt cleaner
MALT-storage

FIG. I. *Flow sheet of the malting process*

Steeping: Steeping of the grain is usually carried out in cylindrical steel tanks with conical bottoms. The tanks are equipped with water supply pipes and overflow facilities. Often, the bottom of the tank is supplied with inlets for compressed air, thus permitting vigorous aeration and stirring of the grain in the water. Generally the temperature of steeping for barley is 55-60° F and the period is 2 to 3 days.

Germination: At the end of the period of steeping, the steep water is drained and the grain is allowed to fall on to a germinating floor which is constructed of tiles or cement. Here the grain is spread out in layers of 3″ to 4″ and is allowed to germinate for 4 to 8 days at a temperature of 55-75° F.

Kilning or drying: The kilns for drying malt have two or three floors, the former being most common. Heated air or hot flue gases are passed up through the several floors and the malt is dropped progressively from the top to the bottom floor as drying takes place. The moisture content drops down to about 12 per cent. Drying is continued for an additional 12-16 hours at temperatures not exceeding 130° F. If the malt is required for brewing, it is dried at a higher temperature of 165-185° F for 4-6 hours. Pale malts are cured at the lower temperature (130° F) while dark malts are cured at the higher temperature (165-185° F). The withered rootlets are sieved and the malt is stored in air tight bins. The extensive uses to which malt and malt products are put to can be seen from Table I.

Malt Extracts

The main object in the preparation of malt extract from the malt is to obtain an easily diges-

TABLE I. *Major uses of malt and malt products*

Product	*Uses*
Brewer's malt	Beer, ale.
Distillers malt	Alcohol, distilled spirits, whisky.
Malt syrups	Baking, candies, breakfast cereals.
Malt extract	Infant and invalid foods, pharmaceutics.
Malt-dextrin sugar	Infant foods.

tible extract rich in maltose and dextrins and having a pleasant taste and flavour. Malt extract can be easily incorporated with milk and dried to give malted milk powder[18]. The process adopted for the preparation of malt extract for incorporation in infant and invalid foods is slightly different from that adopted for obtaining malt extract of B. P. quality for pharmaceutical use[13, 14]. The flow sheet of the former process is given in Fig. II. The process in brief, is as follows:

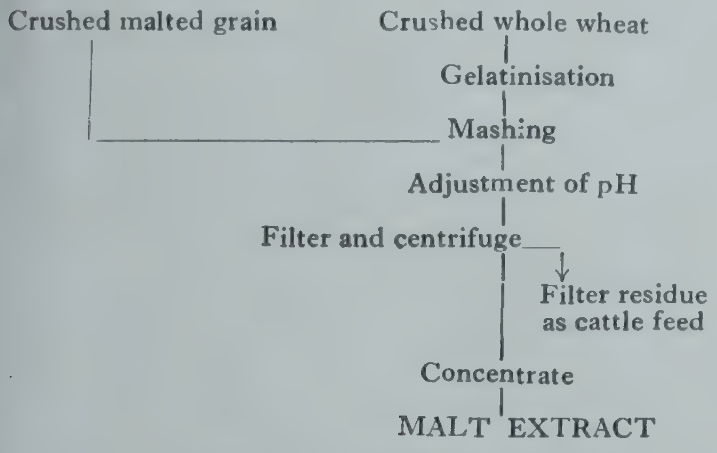

FIG. II. *Flow sheet for preparation of malt extract*

Malt extract for infant and invalid foods

Mashing: The first step in the manufacture of malt extract is the preparation of the mash of barley malt and wheat flour. The purpose of the mashing process is to complete the conversion of the insoluble starch into soluble carbohydrates by the action of enzymes present in the malt. Wheat flour is cooked with about 8 times its weight of water in a kettle at 200° F for about 2 hours. The gelatinized wheat is cooled and is drawn into the mashing tank and is mixed with a suspension of crushed barley malt in water. The proportion of wheat flour to barley malt varies with different manufacturers. The general commercial practice is to use about 2-5 times as much dry barley malt as wheat flour. The purpose of crushing the malt, is to make diastase readily soluble in water and act on the starch. The mashing is done by holding the mixtures at temperatures ranging from 98°F–113°F for 30-60 minutes in order to breakdown the starch and to a small extent the proteins. The temperature is then gradually raised to 158°F in the course of about 30 minutes. The mixture is held at 158° F for 1 hour in order to complete the conversion of the starch to sugars. The proteolytic enzymes are most active at 100 to 120°F and amylolytic at about 140 to 154° F. At temperatures above 170° F, diastase action becomes very weak. The mashing of the mixture of malt and gelatinized wheat flour paste is complete when all the starch has been converted into maltose and dextrin.

Filtration: After the mashing is completed, the husks are allowed to settle and the liquid portion of the mash is discharged into a hot well. The residue in the kettle is washed with two rinsings of water which are also added to the wort in the hot well. The malt extract thus obtained contains about 10-15 per cent total solids. The liquor is neutralised with calcium hydroxide and clarified by centrifugation in a basket centrifuge.

Concentration: The liquors are first concentrated under vacuum in a forced circulation evaporator to about 40-45 per cent total solids. This is further concentrated in a standard vacuum pan to 78-80 per cent total solids. The malt extract thus obtained is a very viscous brown liquid with a pleasant aroma and taste.

Malt extract for pharmaceutical purposes

The malt extract which is used for pharmaceutical purposes should confirm to the B.P. standards.[14] According to the British Pharmacopeia, malt extract is prepared from sound, malted grain of barley or a mixture of this with not more than 33.0 per cent of sound malted grain of wheat by digestion with water at a suitable temperature and by evaporation of the strained liquid under reduced pressure at a temperature not exceeding 55° C until a viscous product is obtained. It contains not less than 4.0 per cent w/w of crude protein (N×6.25).

For the preparation of malt extract confirming to the B.P. standards only the malted grain has to be used and no extraneous addition of unmalted grain is allowed. Malted barley or a mixture of malted barley and malted wheat is mashed with ten times the amount of water at temperatures ranging from 100°-140°F. The procedure adopted for mashing is almost similar to the process described earlier for preparing malt extract for infant and invalid foods. After mashing the malt liquors are clarified by centrifugation and concentrated under vacuum at a temperature *not exceeding* 55°C to about 75-80 per cent total solids. The extract should have a composition and diastase activity conforming to the B.P. standard.

Malt sugar or Dextrin-maltose powder

Malt sugar is a mixture of maltose and dextrin in varying proportions and is being used extensively along with milk for feeding infants.

The important steps involved in the manufacture of malt sugar[1, 15] are as follows:

(*i*) Cooking or gelatinization of the starchy raw material (corn flour or wheat flour) in steam under pressure.

(*ii*) Conversion (saccharification) of starch into maltose and dextrin by barley malt at the optimum temperature followed by the first filtration of the mash.

(*iii*) Neutralization of the mash liquor followed by second filtration.

(*iv*) Concentration to approximately 25 per cent solids followed by percolation through activated charcoal.

(*v*) Concentration in evaporators.

(*vi*) Drying using spray or vacuum band or rotary drum drier. The process is briefly as follows:

Corn, wheat or *Sorghum* flour is added to 8 times the weight of water. Steam is admitted to a pressure of 10 lbs. and the mixture is cooked at this pressure for about 30 minutes. After the cooking process the cereal paste is cooled and treated with a suspension of ground malt in water at 100°-120°F for one hour. The time for conversion varies from two to three hours depending on the product desired. The temperature is gradually raised to about 158°F and the mash is maintained at this temperature for about one hour to complete the hydrolysis of starch into dextrin and maltose. The mash is heated rapidly to 185°F and is filtered. Plate and frame type of filter is used for the purpose. The residue is dried and used as cattle feed. The liquor is neutralized with lime to pH 7.8 and again filtered and concentrated to 25 per cent solids. This is decolourized with activated carbon and again filtered. The decolourized solution is evaporated to 55-60° Brix in a vacuum evaporator and dried in spray drier or vacuum band drier or a rotary vacuum drier. The dry material is powdered in grinders which are located immediately below the receivers, and the product is discharged into hoppers of the packing machine. Malt sugar is highly hygroscopic and has to be powdered and packed in air conditioned rooms having low humidity.

Malt and Malt products in India

A large quantity of malt foods and malt extract preparations are being imported at present in the country. Considerable amount of malt required for brewing purposes is also being imported at present. Since malt foods have been found to be highly valuable in the feeding of infants and invalids, the malt industry is of great national importance and has to be developed in the country. India produces large quantities of barley, ragi and jowar which have been used for the preparation of high quality malt and malt products. At present, there are two or three small units engaged in the manufacture of malt and malt products with a total potential capacity of 100 tons per year. The food industries planning panel appointed by the Government of India examined the status of this industry and recommended an estimated annual target of production of 3,500 tons of malt products per year[16]. In view of the great importance of malt industry in the country's economy, it is hoped that more factories for the manufacture of malt and malt foods will be established in the near future.

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C.F.T.R.I. PUBLICATIONS

1. FOOD AND POPULATION AND DEVELOPMENT OF FOOD INDUSTRIES IN INDIA (*published in July 1952*) pp. xv + 357.

This book brings together the views and suggestions of leading thinkers, industrialists, scientists, demographers and other experts on the two topics. Packed with up-to-date technical and statistical data on several food industries such as fruit preservation, biscuit, chocolate, confectionery, glucose, flour-milling, food yeast, vanaspati, edible oils, fish processing, food machinery and the refrigerated preservation of perishable foods, this authoritative document brings into relief the handicaps and potentialities of these Industries in India. An appendix embodying the recommendations of a Committee of Experts, and a comprehensive index enhance the usefulness of the book.

Price: Indian, Rs. 5.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

2. TECHNICAL AID TO FOOD INDUSTRIES (*published in July 1954*), pp. xvi + 270.

This publication, contains the views and suggestions of prominent scientists, leading industrialists and food technologists, and Government officials on the nature of technical aid needed by different food industries in the country. Up-to-date technical and statistical data are provided and an appendix embodying the conclusions of the Symposium as well as a comprehensive index are given.

Price: Indian, Rs. 5.00 (*postage extra*); Foreign, 10 shillings; $ 1.75

3. INDIAN FOOD LAWS (*published in August 1954*) pp. v + 220.

This volume summarizes all important details regarding the history, operation and enforcement of the food laws existing in different States in India, definitions, descriptions and chemical standards for articles of food including permissible additives (colours, flavours and preservatives) and labelling of foodstuffs. The large number of tables on the comparative chemical standards prescribed for different food commodities in various parts of the country make the book useful for reference and guidance for the public analysts and the legal profession.

Price: Indian, Rs. 4.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during February, 1958 are given in this section.

S (IS) 6

Institution feeding experiments with macaroni products by M. Swaminathan, and R. K. Bhagavan, (*February* 8, 1958). Dr M. Swaminathan who spoke first recounted the earlier experiments carried out at the Institute on the nutritive value of a blend of tapioca flour (75 per cent) and groundnut flour (25 per cent) as compared with other cereals and said that such a blend had the same growth promoting value, if not better, in rats than rice in poor vegetarian diets. He then referred to the earlier work at the Institute in making rice-shaped grains with crude equipment and also to the rat-growth experiments which showed that these grains had slightly better growth promoting value than rice in poor rice diets. A fully automatic plant has since been installed at the Institute and it was found that it was possible to make tapioca macaroni products of required shapes and sizes including those of rice with a blend of tapioca flour (60 parts), specially prepared low fat groundnut flour (15 parts) and wheat semolina (25 parts) which cook and taste like rice. Dr Swaminathan then gave the chemical composition of this macaroni as compared with that of raw milled rice and said that the tapioca macaroni contained 11.3 per cent of protein as compared with only 6.8 per cent in raw milled rice. The calcium content of the macaroni was 53.5 mg. per cent as against only 10.0 mg. per cent in raw milled rice. The iron, nicotinic acid and riboflavin contents of the macaroni were also larger, being nearly thrice as much as in raw rice. An institution feeding experiment was carried out for a period of six months on 32 children between 4 and 12 years to find out the consumer acceptability of the tapioca macaroni products and also to find out the effect of replacing rice in a poor vegetarian diet by this product on the growth, general health and nutritional status of school children. The school children were paired according to initial heights and weights and the members of each pair were allotted at random to the control and experimental groups. The diet survey carried out showed that the calorie intakes were about 1120 calories in each group, almost half the N.A.C. standard. The protein intake in the control and experimental groups were 29.6 g. and 39.7 g. per day as against the N.A.C. standard of 57 g. per day. The calcium intakes in both the groups were also much below the N.A.C. standards. The statistical analysis of the results obtained at the end of the sixth month period showed that there was no significant difference between the two groups in the increases in height, weight and R.B.C. While there was a slight decrease in the haemoglobin level in the control group, a slight increase was noticed in the experimental group, the differences between the two groups being statistically significant. Seven children in the tapioca macaroni group improved in nutritional status while only three children in the rice group showed improvement. Two children in the control group deteriorated in nutritional status while none in the experimental group went down in nutritional status. Dr Swaminathan then referred to the metabolism experiment carried out with 6 children in each of these two groups and said that the nitrogen intake in the control and experimental groups were 4.52 g. and 6.24 g. per day respectively and the retention of nitrogen were 0.70 g. in the control group and 0.91 g. in the experimental group. He concluded by saying that a product like the rice-shaped tapioca macaroni could be used as a rice substitute for meeting the rice shortage in Asian countries. The main advantages of this product are (1) Tapioca which forms the main ingredient gives about 2 to 3 times as much calories per acre as cereal crops (2) Groundnut meal used as a source of protein is available in plenty in India at a low cost as a bye-product of the oil industry and (3) the cost of the finished product is expected to be less than that of natural rice. Such a product has the added advantage that its nutritive value can be easily improved at a slightly extra cost by fortification with calcium, thiamine and riboflavin—the nutrients in which raw milled rice diet are highly deficient.

Dr R. K. Bhagavan who spoke next described the results of an institution feeding experiment carried out for six months on 36 children between 4 and 12 years divided into two equal and similar groups for studying the effect of replacing 50 per cent of raw milled rice in rice diet by enriched wheat macaroni (Nutro Macaroni) on the general health and nutritional status of children. Nutro Macaroni was made with the same plant mentioned earlier from a blend of wheat flour (80 parts) and low fat groundnut flour (20 parts) and fortified with calcium and certain B vitamins. This product contained 19.3 per cent of protein, almost thrice as much as raw milled rice, 390 mgs. per cent of calcium, 0.586 mg. per cent of thiamine, 1.040 mg. per cent of riboflavin and 7.6 mg. per cent of nicotinic acid. The diet survey showed that, as against the children in the institution where tapioca macaroni was tried, the nutrient intakes of children in this institution were almost adequate when compared with the N.A.C. standard. The statistical analysis of the data from the experiment showed that the gains in weight and haemoglobin in the Nutro Macaroni group were significantly larger than those in the control group. There was no significant difference in the increase either in height or the R.B.C. count between the two groups. No child deteriorated in nutritional status in either group. 13 children in the Nutro Macaroni group improved in nutritional status as against only 4 in the control group. Dr Bhagavan concluded by saying that consumption of 3-4 ozs. of this product daily would make up the deficiency in poor Indian diets. The product can be used as a food for invalids and convalescents who require more protein, calcium and B vitamins. It can also be incorporated in the diets of growing children.

Dr Bhatia observed that the experiment with tapioca macaroni has demonstrated that this type of product could completely replace rice in poor rice diet without affecting general health of the people. The experiment with Nutro Macaroni has indicated the need for the development of products like this for improving the general health of the people. In the discussion it was felt that the effect of feeding tapioca macaroni under conditions of adequate calorie intake should also be investigated.

The Director in his concluding remarks said that results from rat experiments could not be reproduced exactly in human feeding experiments. He stressed the need for carrying out the feeding experiments on an extensive scale. He also mentioned incidentally, about the growing realisation among the peoples of the world about the need for evolving good nutritious food from the vegetable kingdom.

S (IS) 7

Oriental techniques in the preparation of predigested protein foods with special reference to soy sauce, by B. S. Lulla, (*February* 15, 1958). Certain moulds and bacteria are storehouses of proteolytic and diastatic enzymes. Chinese scientists used these micro-organisms for producing predigested protein foods such as soy sauce, miso etc., from a mixture of soy beans and wheat or barley. These foods are very popular in South East Asian countries and are consumed daily for the protein enrichment of the diet and also as a flavour improver.

The soy sauce and miso industry is considered as one of the biggest food processing industry of this region. Soy sauce during the war time, due to shortage of whole soya beans, was also prepared from peanut meal, soy bean meal, oil seed cakes and silk-worm pupae. Wheat bran, rye, kaoling and other carbohydrate bearing materials were recommended in place of wheat.

The speaker then described various techniques for the preparation of brewed and chemical soy sauces. The available literature on the preparation of soy sauce was reviewed and the present methods followed in countries like China, Japan, Korea and United States were presented and discussed in detail.

The speaker then touched on the role of micro-organisms in the preparation of soy sauce and pointed out that there are no microbiological hazards in the process as no harmful organisms could thrive in 20 per cent brine. The chemical composition of different grades of soy sauce was presented and it was mentioned that soy sauce fortified with thiamine and riboflavin on storage for one year loses 10 per cent thiamin and 5 per cent riboflavin. Further the soy sauce has a meaty taste which is generally attributed to the presence of monosodium glutamate. The list of flavouring substances isolated from soy sauce cake was presented and it was pointed out that soy sauce has bacteriostatic and fungistatic actions. The fungistatic action was characterised by the presence of isovalerate which is formed by the β-oxidation of Phenyl alanine. It was then emphasised that chemical standards should be evolved for determining the quality in soy sauce as there are no adequate methods available other than organoleptic evaluation.

The speaker then said that soy sauce in India is imported in limited quantities from Hong Kong and Indonesia and is being sold at Rs 3-4 per pound. Although raw materials for the preparation of soy sauce are available in plenty in our country, no one has attempted so far, to produce soy sauce in India. The speaker then described in detail the work carried out in this Institute for the preparation of soy sauce. The essential steps in the preparation of soy sauce were that soy beans were soaked and cooked in an autoclave and then mixed with roasted powdered wheat in the ratio of 2:1. This material was then inoculated with a mixed culture of two strains of *Aspergillus oryzae*, *Hansenula sub-pelliculosa* and *L. delbrueckii*, and spread in trays. The material was allowed to ferment for 3-4 days, the mouldy mass was then packed in deep tanks and 20 per cent brine was added enough to cover the mass completley. The material was then allowed to ripen for 6-8 weeks and the whole mass was extracted. The extract was clarified, pasteurized, preserved (by the addition of 750 p.p.m. of Sodium Benzoate) and bottled. One pound of soy beans yields about 3-4 pounds of soy sauce. The speaker pointed out that approximately 50 per cent of the total protein is utilized in the process. The cost accounting of soy sauce was presented and the cost per 10 oz. bottle of soy sauce containing 8 oz. of the material was calculated at 22 naye paise. The speaker then described a method for the preparation of sauce cubes, Worcestershire sauce and marmite like pasty product named as 'Soyco'. The chemical composition of Soyco, marmite, vegemite and Bovril was presented. The speaker then pointed out difficulties in removing salt from soy sauce and later pointed out a method for the preparation of salt free production named 'Aminol'. This product contains 40 per cent soluble protein and 1.2 per cent of free amino acids. By paper partition chromatography, it was shown to contain all the essential amino acids.

The speaker then described methods for the preparation of miso (soy bean paste) and predigested protein rich foods. The possibilities of their use in enriching protein in various Indian dishes were indicated. The Oriental techniques were extended to the preparation of high quality cheese. The speaker in his concluding remarks said that the microbial digestion technique appears to have immense possibilities of converting oil seed cakes and other low grade foods into a high class article of human food.

The discussions covered points such as utilization of soy sauce residue after extracting sauce and effect of head space in bottles on the quality of sauce. The President in his concluding remarks emphasized the need for demonstration of the preparation of sauce to the housewives, to modify the sauce to suit Indian taste and the need for developing a product where all the essential ingredients of the materials used, are well utilized.

Information and Advice

In pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Canning dry pack of prawns

E (IS) 17

We shall thank you to let us have complete directions for the best mode of canning dry pack of prawns? (Bombay).

When the prawn net is emptied and the prawns are culled from seaweed etc., they should be thoroughly washed in sea water to remove all dirt, slime etc. The prawns should then be iced sufficiently to avoid heating and subsequent black staining of the prawns. Holding of the prawns for at least 5 to 10 hours also assists in the easy removal of the shells. Peeling consists of removing the hull, legs and head and is carried out by hand. The meats are washed by fresh water in a flume which carries them from the picking table to the canning room. The drained meats for dry pack are placed in metal basket of 25 lb. capacity, blanched for usually 10-12 minutes in boiling brine containing about 1 pound of salt per gallon of water. A complete change of brine is made after about every seventh cook. The meats curl during blanching operation and take on their characteristic pink colour. If the brine is not kept boiling vigorously the meats will link together and curling will not occur. After blanching, the prawn meat is drained by spreading the meats on screen frames. Air blower may be used to hasten drying. The fairly dried prawns are placed in a can* which is closed under mechanical vacuum of not less than 12 inches.

The cans should be processed (as soon as possible after closure) as follows:

Can size	Processing time in minutes	
	At 240°F	At 250°F
211 × 400	80	60
307 × 208	70	50

After processing, the cans should be promptly water-cooled.

The following equipment is required in this connection: Can reformer, hand flanger, seaming machine, semi-automatic vacuum sealing machine, retort and miscellaneous items like stainless steel baskets, etc., The Metal Box Co., (India), Calcutta may beapproached for the supply of the above items of equipment.

Preparation of tomato soup

E (IS) 18

We would very much appreciate if you can kindly furnish us the recipe for the preparation of tomato soup? (Bombay).

Firm and fully ripe red tomatoes are chopped, heated for 5 to 10 minutes till the skin separates out from the pulp and it is then passed through pulper and the soup prepared according to the recipe and instructions given below:

Tomato pulp	...	...	100	lb.
Water	...	...	35	,,
Onions (chopped)	...	...	24	oz
Salt (powder)	...	...	28	,,
Butter	...	...	28	,,
Sugar	...	...	32	,,
Flour	...	...	16	,,
Garlic (chopped)	...	...	1.25	,,
Pepper (ground)	...	...	1	,,
Cinnamon, cardamom and other spices (as desired)	...		0.5	,,

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* S. P. lacquered cans lined with "C"-enamel, seafood formula are suggested for prawn meat. Cans for "dry-pack" shrimp should be lined with a one-, two-, three-piece vegetable parchment paper-liner.

The tomato pulp is brought to oiling point and butter is added. dd onions and garlic and simmer or 30 minutes. Flour is made into hick paste and boiled and strained hrough cloth. The strained liquid s mixed with boiling tomato juice. ome prefer to keep spices, onions nd garlic in a cloth bag and allow t to immerse in the tomato pulp nd. gently boil the mass for 30-45 minutes. If the spices are added directly to the pulp, the entire boiled mass is passed through a sieve or screen or pulper with fine sieve. It is heated again and filled hot into cans (not below 165°F). Cans are sealed and processed for 45 minutes at 240°F in retorts.

Canning of green peas

E (IS) 19

Will you be kind enough to supply me the information regarding the method of canning green peas and the firms who can supply the machinery required for the purpose? (Madras).

Select matured but slightly tender green pea pods and sort them so as to select only those which may be free from blemishes. Shell the pods to get the pea grains. Wash thoroughly the grains to remove dirt, soil and other extraneous matter. Grade them according to size and maturity.

The peas after necessary sorting and grading are wrapped in a piece of muslin cloth and then dipped in boiling water for 3-5 minutes, the time depending upon its maturity. Remove the muslin bag from the boiling water and give a dip in cold water immediately afterwards. The boiling water for blanching should be used as long as there is no frothing and should then be replaced by fresh water.

Fill the sterilized cans with the blanched peas so as to contain the minimum weight of peas as under:

For A $2\frac{1}{2}$ size cans the drained weight should be...	19-20 oz.
For butter size cans ...	$9\frac{1}{2}$-10 ,,
For pint glass jars ...	10-11 ,,

Fill the interspace with hot 2-3 per cent brine (common salt solution containing 1—1.5 per cent sugar and 0.5 per cent citric acid) leaving a headspace of ($\frac{1}{4}$-3/8") at the top. The brine should be filtered through a thick cloth to remove all traces of dust etc.

Place the filled cans in boiling water bath with a false bottom (an open pan with 2-4 layers of thick cloth placed at its bottom) till the centre of the can records a temperature of 170°-180°F for 6-10 minutes. This time of exhaust will vary with the nature of the pack. In place of the thick cloth a small frame work of wood to serve as false bottom is also very often used.

Immediately after the exhaust process is complete, the cans are sealed with a can sealer ensuring that the contents of the container are perfectly sealed off from the outside contamination.

The vegetables in the sealed containers are processed i.e., heated at 240°F which corresponds to 10 lbs. pressure in a pressure cooker for 40-45 minutes.

Remove the cans from the pressure cooker with a pair of tongs and place them immediately under running cold water. Finally store the product in a cool dry place.

The equipment required for the canning process can be obtained from the following firms:

(*a*) Can sealer is a simple machine which can be had from Messrs. The Metal Box Co., of India, Calcutta, who also supply empty cans. It must be tested with an empty can before being used for the filled cans as above.

(*b*) Pressure cooker can be had from food machinery dealers like Messrs. Gardners Corporation, Connaught Circus, New Delhi.

Transport of vegetables

E (IS) 20

Vegetables like cauliflower, cabbage, beet root, carrot and tomato are generally packed in closed wooden boxes and transported to distant parts in closed wagons. What would be the storage life of the commodities? (West Bengal).

The storage lives of vegetables like cauliflower, cabbage, beet root, carrot and tomato packed in closed wooden boxes during transportation in closed wagons without refrigeration would be very short. Due to the heat of respiration of these vegetables, the temperature inside the closed wagon may rise as high as 140°F, thus causing damage to the commodities. Railway authorities should be requested to introduce refrigerated or louvered wagons for the transportation of perishable foods. Instead of closed wooden boxes, the use of wooden crates with slits for aeration would be advisable.

Keeping quality of onions

E (S) 21

Kindly suggest to me an effective and easy method of improving the keeping quality of onions at room temperature. (Karnal).

The keeping quality of onions at room temperature can be improved considerably with the aid of a pre-harvest foliage spray of a plant hormone called maleic hydrazide. An aqueous solution containing 600 p.p.m. of maleic hydrazide is prepared and the onion plants are sprayed with it 18 days before the harvesting of the crop, each plant receiving 10 c.c. of the solution. After harvest the onions can be stored in the usual way. Maleic hydrazide can be purchased from firms like Bombay Chemicals Private Ltd., 129, Mahatma Gandhi Road, Bombay-1.

Utilization of jaggery and brown sugar

E (F) 22

Can you write to us the method of eliminating the peculiar taste and smell of brown sugar and jaggery so that they can be conveniently used in the preparation of fruit products. (Madras).

The peculiar taste and smell of brown sugar and jaggery cannot be completely eliminated without resorting to proper refining as done in sugar refineries for the production of refined sugar. For use in certain types of processed fruit products, the flavour may be suppressed somewhat by flavouring strongly with a suitable flavour, but the saline taste of jaggery persists, so that the product does not become quite acceptable. The taste and smell may be masked to a certain degree by using jaggery or brown sugar only as partial substitutes for refined sugar, but for the preparation of really good quality fruit products, only refined sugar is recommended.

Baker's yeast

E (IS) 23

The most commonly used method for the manufacture of yeast involves the use of the 'molasses-ammonia' process. In this process, carefully selected strains of yeast are seeded into a dilute solution of molasses, mineral salts and ammonia and permitted to grow. The solution is kept well aerated by passing sterile air through it. This aeration inhibits fermentation and thereby leads to the more efficient utilization of the carbohydrate substances present in the solution. Careful control is exercised over conditions of temperature, hydrogen ion concentration, adequate ammonia and mineral supply and all other factors that affect yeast growth. After growth ceases, the yeast is separated from the exhausted solution either by filtration or centrifugation, washed, compressed and packaged in 1 lb. cakes. It is stored at low temperatures preferably at 32°F when it can be kept for 2 to 3 months without deterioration.

For preparing active dry yeast, after the final filtration and washing, the yeast is extruded in short noodle forms on to a conveyer which passes through a drier whereby the moisture content of the yeast is reduced from 30 per cent to about 8 per cent. During drying, the yeast is rendered dormant and can be transported and stored without refrigeration. Prior to its use in a dough, it should be rehydrated by soaking in 4-5 times its weight of water at about 105-110°F for 5-10 minutes. Dry yeast retains its activity for many weeks when stored at 70-80°F. When kept at 40°F, it remains viable for many months.

Coconut water

E (IS) 24

Could you inform us some details regarding coconut water and about its food value? (Baroda).

Tender coconut water is a popular and refreshing drink and has the advantage of being sterile. 6-7 month old coconut, fully grown but still unripe, contains the maximum amount of water (400—465 c.c.) and the highest concentration of solids and sugars and thereafter decreases to 200—300 c.c. upto the 13th month when the fruit is fully ripe. The sugars constitute the bulk of the solids. Reducing sugars increase from 1—1.5 per cent to a maximum of 5 per cent in the 7th month and thereafter, decrease to about 1 per cent up to the 13th month. In the early stages, the fruit does not contain any non-reducing sugars which appear for the first time in the 6-7 month old fruit and gradually increase to about 1 per cent in the fully ripe fruit. Dextrose, laevulose and sucrose are known to be present in the ripe coconut water. The proteins in coconut water consist of most of the essential amino acids with a higher content of arginine, alanine, cystine, and serine, than in cow's milk. Potassium and sodium are the principal mineral constituents.

Analysis of coconut water shows the following values: water=95.5; protein 0.1; fat<0.1; minerals 0.4; carbohydrates 5.0; calcium 0.02; phosphorus<0.01; iron 0.5 mg; vitamin C 2.2—3.7 mg. nicotinic acid 0.64; pantothenic acid 0.52; biotin 0.02; riboflavin<0.01; and folic acid 0.003 μg/c.c.; and thiamine and pyridoxine in traces.

Chewer's favourite

ASOKA SCENTED BETELNUT POWDER

Manufacturers:

M. K. Krishna Chetty, Post Box No. 106, Coimbatore

Notes and News

STATISTICAL NOTES

All-India Final Estimate of Potatoes, 1956–57

	1956–57 (Final Estimate)	1955–56 (Partially Revised Estimate)
Area (thousand acres)	702	691
Production (thousand tons) ...	1674	1830

(*Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India*)

NEWS BRIEFS

Radioactive protection of foods: British atomic scientists have been working on the use of radioactive atomic materials with a view to improving considerably the storage life of foodstuffs. Sprouting of potatoes in store can be easily prevented by the use of irradiation at very low doses. The sprouting is delayed by many weeks and such a method is considered of great importance in supplying seed potatoes from Britain to other countries. When heavy doses of radiation are used, the seed potato can be prevented from sprouting for nearly a year. The most important use of radiation is in getting rid of the insect infestation in stored grains. Weevils and beetles present in stored grains can be easily destroyed by irradiation. The report says that there is no danger in using the radiation technique in protecting foods. The treated food is said to be no more radioactive than it would be in the case of a person after undergoing an X-ray examination. The method, according to the report is also quite inexpensive and can be adopted in various foodstuffs. The technique, however, presents some problems still to be overcome. A musty smell is sometimes produced in the food and in the case of meat when strongly irradiated the colour darkens and a distinctive flavour arises. Radiation techniques can be successfully combined with other methods of preserving food with great advantages. (*Austr. Food Manuf.*, January 6, 1958).

New seasoned seafood tenderiser: A new, seasoned tenderiser for seafood processors has come up in Canada. The product designed for use prior to either quick freezing or cooking is a blend of spice, essential oils and tenderising solution with a small proportion of sodium benzoate added. Called 'Spisorama', seasoned seafood tenderiser, the liquid solution is ready for use. Seafoods to be processed should be completely immersed in the preparation for a period of 30 seconds, then frozen or cooked immediately. Quantity to use depends upon the batch being processed and the solution may be re-used, adding only sufficient tenderiser to again cover completely. Processing immediately after immersion by either quick freezing or cooking is essential in order to stop the tenderising action and prevent breakdown. The new product is available in two forms, seasoned and unseasoned. (*Austr. Food Manuf.*, January 6, 1958).

Storage life of frozen fish products extended by glucose-salt brine glaze: Freezer-burn and rusting are the two important causes of loss of quality in stored frozen foods. Scientists at the Boston Technological Laboratory have successfully overcome these defects by freezing fish in a refrigerated glucose-salt brine mixture. A lasting crackfree glaze was formed on the fish which protected it during its subsequent cold storage. This work has been extended to the freezing of shrimp on board the vessels at sea. The treatment extends the storage life of foods considerably without in any way affecting the edible quality of the product. (*Food Trade Review*, October, 1957).

Utilization of fish waste: Fish waste has been successfully converted into a feed for fur animals, such as mink in U.S.A. Non-commercial species of whole fish are also used for the purpose in Oregon. The waste must be fresh and free of thiaminase. The manufacturing process of feed from fish waste is essentially one of grinding the fresh waste, packing in paper bags, freezing the bags with the waste and keeping them in frozen state until needed. (*Commercial Fisheries Review*, December, 1957).

Moisture determination in fish: A rapid method for the determination of moisture in fish and fish products has been described by Russian scientists. A sample of the material weighing from 3-5 g. was placed between two metal slabs and warmed by an electric current to a temperature of 130-150°C. After drying for about 3-5 min. the sample was cooled and weighed. It was found that the best temperature of drying for fresh, salted or smoked herring and for red herrings is 150° C, time for drying 55 min. The differences from the standard method were from -0.59 to $+0.48$ per cent. The time taken for the two parallel determinations was 35 min. (*Food Manuf.*, October, 1957).

Vegetable milk: A milk product for those who are unable to digest animal fat of the type contained in ordinary milk or who are suffering from heart and artery disease has been introduced by Alfonal Ltd., and will shortly be released in a part of London through Mortlock's Dairies. Known as 'Alfona', it is a separated milk product said to contain special vegetable fats of high iodine value. (*Food Manuf.*, October, 1957).

DRAFT INDIAN STANDARDS

Wheat Atta: The draft Indian Standard Specification for *Wheat Atta* prescribes physical and chemical requirements like microscopic appearance, moisture, total ash, acid insoluble ash, gluten, crude fibre, acidity, etc., the sampling procedure, and methods of tests for these requirements. Taking into consideration the nutritional aspect, the draft standard envisages enrichment of *atta* with calcium carbonate, thiamine, riboflavin and niacine. In the preparation of this standard, the sectional committee took into consideration the actual data on the composition of wheat *atta* manufactured from different varieties of wheat produced in various parts of India and imported from abroad. It has also given due weightage to the relevant rules issued by the Government of India under the Prevention of Food Adulteration Act, 1954 (*I.S.I. Bulletin*, November, 1957).

Maize Starch: Maize starch is used in large quantities in the cotton textile industry. The Indian maize starch industry came into being in 1938 and developed rapidly under war conditions when import of starch on which the cotton textile industry principally relied, suddenly stopped and the industry had to draw its requirements from indigenous sources. The Indian starch industry today is sufficiently developed to meet the entire local demand. It is expected that a standard specification for maize starch would be of use to the producers in preparing maize starch of acceptable quality and to purchasers in acquiring dependable supplies. The draft Indian Standard Specification for Maize Starch for use in the cotton textile industry prescribes requirements of maize starch (as manufactured by the sulphitation process) in respect of size of granules, moisture, starch, ash, protein, ether extract, free acidity, relative viscosity and cold water solubles. Methods of test for various characteristics of the starch are appended to the draft. (*I.S.I. Bulletin*, November, 1957).

PATENTS (Indian)

57,684. *Improved trolley for use in processing tea leaf:* Earth pair of supporting brackets has a pair of trays slidably mounted side by side, the trays being adapted to be pulled outwardly towards or pushed inwardly from, opposite sides of the trolley. Patented by Eastwood (*Res. and Ind.*, Dec., 1957).

59,878. *A wet starch manufacturing process:* Subjecting starch bearing grain to steeping and cracking and feeding the material to a high speed rotating rotor disc. —Patented by Corn Products Refining Co. (*Res. and Ind.*, Dec., 1957).

56,465. *Improvements in foodstuffs:* A small proportion of an ester of an aliphatic hydroxy carboxylic acid (C_{18} -C_{14}) and a mono-, di-, or trivalent alcohol (1-5 carbon atoms) is incorporated in an oleaginous foodstuff.—Patented by Uniliver Ltd. (*Res. and Ind.*, Dec., 1957).

(Foreign)

780,441. *Butter fat:* Relates to an improved process of preparing butter fat which is suitable for admixture with skim milk powder to give a product which can be reconstituted with water to form a milk of similar composition to standardised whole milk and is almost free from a cooked flavour attributable to the butter fat.—Patented by New Zealand Dairy Products Marketing Commission (*Food Trade Rev.*, Oct., 1957).

780,860. *Preserving.* Relates t a process for effecting a long-ter preservation of liquid dairy product such as milk and cream, which consists in raising the products to temperature between 90°C and 93°C and thereafter subjecting them to gaseous pressure by injecting oxygen and maintaining this pressure to prevent the development of the spores which are not destroyed by the heat treatment until such time as the products are required for use.—Patented by J. N. Wiser (*Food Trade Rev.*, Oct., 1957).

781,087. *Baked products.* Relates to a method of making baked products having reduced starch content which are more palatable and nutritious comprising prepared wet gluten from wheat flour, wheat germ, wheat bran and salt, so as to form an aerated dough, dividing the dough into portions and baking and drying them.—Patented by Whitworths Holdings Ltd., (*Food Trade Rev.*, Oct., 1957).

C.F.T.R.I. NEWS

The following distinguished personalities visited the Institute during February, 1958:

Shri V. S. Hejmadi, Chairman, U.P.S.C.; Dr J. W. Whitaker, Deputy Director-General, Scientific and Industrial Research; Gen. S. S. Sokhey, Lenin Prize Winner and Member of the Institute's Executive Council (Also addressed the Seminar on 'Science and the Future'); Dr K. B. Lal, Plant Protection Adviser to Government of India; Dr A. R. Sundararajan, Director, Central Food Standards Laboratory; His excellency Ellsworth Bunker, American Ambassador in India, (Also addressed the Staff of the Institute).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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BROT UND GEBACK

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

Sodium content of foods and he planning of low sodium iets, by Bhagwan, R. K., Swaminathan, M. and Subrahmanyan, V., *J. Mysore med. Assoc.*, 1957, **22** (2), 1.—Low sodium diets are assuming mportance in recent years because f its therapeutic usefulness in several diseases. Sodium is present practically in every foodstuff, either of the plant or animal source, and as such patients on low sodium formula are adviced not to use extra salt. The functions of sodium in human metabolism have been given. It helps to maintain the osmotic equilibrium between the extracellular fluid and the tissue cells. In conjunction with bicarbonates and phosphate, it maintains the pH of blood within normal limits. The sodium and potassium contents of several cereals, pulses, leafy and other vegetables, fruits, nuts, oilseeds and flesh foods have been given in tables. Drinking as well as cooking water contain sodium in varying amounts (10-30 mg. per litre) and this factor has also to be taken into consideration when low sodium diets are formulated. Addition of salt to prepared foods increases the palatability and if these foods are to be included in the diet of patients, 'salt substitutes' like potassium and ammonium chloride may be used in place of salt. Sodium in very small amounts is also supplied by the spices used in the diet. Sodium restricted diets are useful in diseases like congestive heart failure, hypertension, renal disease, cirrhosis of the liver, toximias of pregnancy, Menier's disease and during A.C.T.H. and cortisoul therapy in various diseases to prevent sodium retention. The nutritional implications of sodium restriction have been discussed. A food chart helpful in the planning of sodium restricted diets has been given. There are broadly two classes of low sodium diets: (*i*) strict low sodium diet with 200-300 mg. of sodium daily and (*ii*) moderately low sodium diets with 400-600 mg. of sodium daily. A patient on low sodium diet must avoid all salted and canned vegetables and pickles, salted butter, cheese and nuts, canned meat or fish, bacon, ham, sausages and corned beef. K.L.R.

Infant food from buffalo milk. I—Effect of different treatments on curd tension, by Chandrasekhara, M. R. *et al.*, *Food Sci.*, 1957, **6** (10), 226.—A simple curd tension meter for determining the curd tension of milk has been described.

The effect of heat and addition of phosphates and citrate on the curd tension of buffalo milk has been studied and it has been found that the curd tension of buffalo milk is reduced to a very low figure as a result of heat processing and addition of phosphates or citrate.

Infant food from buffalo milk. II—Standardization of condition for the preparation, by Chandrasekhara, M. R., Sreenivasamurthy, V., Swaminathan, M., Bhatia, D. S. and Subrahmanyan, V., *Food Sci.*, 1957, **6** (10), 228.—Infant food having a low curd tension, good solubility and palatability and low bacterial count has been prepared from buffalo milk collected in a dairy in Mysore. An infant food having a low bacterial count (35600/g. of powder) could be prepared from liquid milk having high bacterial count (3-4 millions).

When the milk is collected in sterilised vessels and transported in a chilled condition, the bacterial count of the raw milk as well as that of condensed milk and infant food has been found to be very low.

Collection and storage of milk for 1 and 3 hours in brass vessels has been found to increase the copper content of the infant food to 8.3 p.p.m. and 14.1 p.p.m. respectively while infant food prepared from milk collected and stored in aluminium vessels had a low copper content (4.4. p.p.m.).

Infant food from buffalo milk. III—Shelf life of the product, by Chandrasekhara, M. R., Swaminathan, M., Bhatia, D. S. and Subrahmanyan, V., *Food Sci.*, 1957, **6** (10), 232.—The keeping quality of infant food prepared from buffalo milk using Niro spray drier and packed in air and in nitrogen has been studied. The food prepared from milk collected in aluminium vessels under average prevailing conditions in the dairy, and packed in 8 oz. cans under nitrogen (7.5 per cent O_2 in head space gas) had a shelf-life of 8 months at 37°C and about 16 months at 27°C.

An infant food having a low bacterial count (4 thousand) and satisfactory shelf life could be prepared from dairy milk having a high bacterial count (4-5 millions).

Contamination of fluid milk with copper caused by keeping the milk in brass vessels, affects adversely the shelf life of the infant food.

Fair agreement was observed between the development of off-flavour assessed organoleptically and the peroxide value of the fat in the powder.

Infant food from buffalo milk. IV—Large-scale production of infant food, by Subrahmanyan, V., Chandrasekhara, M. R., Swaminathan, M. and Bhatia, D. S., *Food Sci.*, 1957, **6** (10), 238.—India has been importing over 3,000 tons of different kinds of infant foods and the quantity of milk required for producing this is 30,000 tons of fluid milk. This amount of fluid buffalo milk is available in certain surplus milk producing areas in the country. A process for the preparation of infant food from buffalo milk has been evolved by the AA. The important steps in the products are: (*i*) reduction of fat content of buffalo milk to 2.5 per cent, (*ii*) addition of phosphate buffer salts to reduce curd tension, (*iii*) addition of sugar so as to reduce the protein and fat contents of the final product to 22 and 14 per cent respectively, (*iv*) concentration, (*v*) fortification with vitamins and homogenisation, (*vi*) drying in spray driers and (*vii*) packing in nitrogen atmosphere. Larger scale production of infant food following the above process has been carried out at the modern dairy plant of the Kaira District Co-operative Milk Producers Union, Anand. A flow sheet of the manufacturing process has been given and the details of the various steps involved are described. The composition of infant food prepared at Anand is included in a table. The solubility of the product is 99.5 per cent and the standard plate count of the powder is reported to be 20,000 per g. which is much lower than the American standard. K.L.R.

Infant food from buffalo milk. V.—Infant feeding trials, by Chandrasekhara, M. R. *et al.*, *Food Sci.*, 1957, **6** (10), 241.—Feeding experiments with an infant f prepared from buffalo milk w conducted in three centres strict medical supervision on 75 infants. The infant food co tained 22 per cent protein and per cent fat and was forti adequately with vitamins A and D Records regarding the growth general health of the infants the digestibility of the food maintained.

The results showed that all th infants digested the food readily The infants consumed the recons tituted milk with great relish an there were no cases of vomiting after the ingestion of the milk. The average rate of growth of the infants was quite satisfactory comparing well with the average rate of growth of Indian infants available in the literature.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Effect of exogenous insulin on the dehydroascorbic acid and glutathione content of tissues in scurvy, by Sacchidananda Banerjee and Haobam Devendra Singh, *J. sci. industr. Res.*, 1958, **17C** (1), 1.—The interrelationship between the insulin content of pancreas, the glutathione content of blood and tissues, and the occurrence of dehydroascorbic acid in the tissues of scorbutic guinea-pigs has been investigated. Also, the effect of exogenous insulin on the glutathione and dehydroascorbic acid content of the tissues in scorbutic conditions has been studied. With the occurrence of dehydroascorbic acid in the tissues of scorbutic guinea-pigs, the glutathione content of blood and tissues and the insulin content of pancreas decrease. Exogenous insulin conserves the glutathione content of tissues in the scorbutic condition but has no effect on the dehydroascorbic acid content of the tissues. Diminished insulin formation does not seem to cause the imbalance of the reducing systems in scorbutic guinea-pigs.

Studies on insect biochemistry: Part I—The water-insoluble growth factors in yeast by Sivaramakrishnan, R. and Sarma P. S., *J. sci. industr. Res.*, 1958, **17C** (1), 4.—The additional factors present in the water-insoluble fraction of yeast, necessary for the growth of *Corcyra*, have been obtained in a water-soluble form by appropriate enzymic or acid digestion and their properties have been studied. The factors cannot be extracted with ether nor can they be replaced by biotin or lipoic acid. They can, however, be removed by adsorption on charcoal. The possible peptide nature of the factor or factors is indicated.

Blood glutathione levels in the diabetic, by Lal, S. K. and Shiv Kumar, *Indian J. med. Res.*, 1958, **46** (1), 47.—Conflicting opinions have been expressed by several workers regarding the level of glutathione (G.S.H.) in the blood of patients suffering from *Diabetes mallitus*, where lower as well as normal values have been reported. A lowering of blood G.S.H. with the increase of blood sugar has been observed in rats and rabbits. The AA have in this investigation studied as to whether or not the blood G.S.H. levels altered in human subjects suffering from *Diabetes mellitus*. 26 cases of *Diabetes mellitus* and 94 normal healthy adults have been selected and blood glutathion, both reduced and total, have been determined by the iodimetric titration method of Woodward and Fry (1932). Blood sugar also has been estimated in every case. The results show a wide variation even in the case of normal subjects, blood glutathione values ranging between 24.5 and 46.1 mg. per 100 c.c. of blood. oxidised glutathione ranging between 1.8 and 18.4 and the total glutathione between 28.8 and 53.7. Blood sugar range is 70—100 mg. per 100 c.c. blood. The glutathione bears a negative significant correlation with blood sugar in normal persons indicating that a high level of blood sugar in normal persons reflects a lower blood G.S.H. level. In the case of diabetics, however, no such correlation is observed.

The average concentration of blood glutathione and total glutathione is considerably lower as compared to the normal.

K.L.R.

Studies on the optimum level of fat in the diet, by Balasubramanian, S. C., Ghosh, S. N. and Basu, K. P., *Indian J. med. Res.*, 1958, **46** (1), 79.—There is no conclusive evidence at present on the amount of fat needed in the human diet. Work on the comparative merits of animal fats and vegetable fats and also the value of different levels of fat in the diet have been done at different places. Margarine corn oil, butter etc., which are not common in India have been used for this purpose. The AA have, therefore, carried-out experiments with young albino rats fed varying levels of butter, sesame and groundnut oils in isocaloric diets. The rats were divided into five groups and the first four groups were given isocaloric diets containing 2, 5, 10 and 20 per cent of the different fats respectively and the fifth group was maintained on the laboratory stock ration as control. Average weekly growth during the experimental period of 8 weeks has been recorded in each case. The growth of rats on the experimental diets equalled that of the control group at all the levels of fat. The results of the growth rates computed as growth per calorie intake show that there is no significant difference between the various levels of fat studied. Animals on groundnut oil showed the poorest growth, particularly those fed on the 5 per cent groundnut oil ration, as compared to the rats on stock ration. It was observed throughout the experiments that male rats showed a higher rate of growth than their female counterparts. Since the growth response to the variation in the level of fat in an adequate diet was not marked, the AA have examined the total liver lipid content of rats fed varying levels of sesame oil. The results of this indicate that the liver lipid store of rats in the control group and the high fat diet containing 20 per cent sesame oil was less (about 7 per cent) than the animals on lower levels of fat (about 10 per cent).

Preparation of protein hydrolysate from oil cakes, by Krishnamurthy, C. R., *Res. & Ind.*, 1957, **2** (11), 287.—There is a wide prevalance of protein deficiency diseases among our people and as such there is an urgent need to provide good quality proteins as supplements in their dietaries. The present annual production of proteins of animal origin can meet only a fraction of the requirements. There are, however, vast resources in the vegetable kingdom, that can be tapped. The oil cakes are of great interest in this respect. In this paper, the A. describes the method of preparing enzymic digests from oil cakes, particularly mustard and *til* cakes for use as oral supplements in protein therapy. Mustard and *til* cakes contain protein biologically rather than that of groundnut. The preparation of the digests is covered by a patent. The method consists of three essential steps, *viz.*, isolation of the protein from completely defatted cake, hydrolysis of the protein with enzymes under optimum conditions and concentration of enzymic extract under *vacuo* to a syrup and drying it to a powder under vacuum. A flowsheet of the various steps involved in the process is given. The yields of isolated protein and the nitrogen recovery have been given in a table. The overall yield of hydrolysate preparation was 15—20 per cent on the basis of the starting material, with a recovery of 30—40 per cent of the nitrogen content of the oil cake. The average chemical composition of the hydrolysate with reference to nitrogen, phosphorus, ash and amino nitrogen contents has been determined and the figures compared with those of two well known imported products *viz.*, Co-Amino and Ledinac. The amino acid composition has been determined by microbiologically colorimetric and chromatographic methods. It is found that the hydrolysate is rich in all essential amino acids except tryptophane. About 76 per cent of the nitrogen is present in the amino form. The hydrolysate when supplemented with glucose promotes bacterial growth and is comparable in this respect with Difco peptone and Ledinac.

K.L.R.

BAKERY

Production of Baker's yeast, by Lewis, Y. S. *et al.*, *Res. & Ind.*, 1957, **2** (11), 298.—Baker's yeast, used by the bakery industry, in India is wholly imported and it is very expensive. The AA have standardised a method for the production of active dry baker's yeast (A.D.Y.) using the cheaply available cane molasses as the raw material. A strain of *Saccharomyces cerevisiae*, Hansen *Var*, Ellipsoidens is inoculated into a sterilized medium containing 4 per cent molasses, 0.1 per cent ammonium sulphate or urea and 0.1 per cent potassium dihydrogen phosphate in two 4-litre flasks and aerated for 24 hours. The yeast crop obtained from this is next used as the inoculum for a 20-litre culture in a stainless steel tank. The yeast grown in the tank is separated by centrifuging, washed thoroughly with water and concentrated in a basket centrifuge to a moisture content of 60 per cent. The white cake is shredded and dried for about 5-6 hours in thin layers in a current of cold air. Yield of dry yeast in a typical experiment is given. The sample of A.D.Y. has been analysed for moisture, trihalose, viability, dead cells, iodine titre and baking strength and the results have been tabulated along with those for some commercial samples for comparison. The storage life of the product depends on several factors such as culture conditions, storage temperature and method of packing.

K.L.R.

CEREALS

Effects of maleic hydrazide on an early variety of rice, by

Misra, G. and Sahu, G., *Curr. Sci.*, 1958, **27** (2), 64.—The AA have studied the effect of maleic hydrazide (M.H.) on the growth and yield of an early variety of rice. Uniform seed grains of N. 136 variety of rice were soaked with 10,000, 1000, 100 and 10 p.p.m. of MH-40 for 48 hours and these pre-soaked seeds were washed thoroughly in water and sown in pots. The plants were treated with weekly foliar spray with the corresponding concentrations. Spraying was discontinued after 2 weeks, as detrimental effects were observed. Plants treated with 10,000 p.p.m. died after the 1st foliar spray and majority of the plants treated with 1000 p.p.m. died after the second foliar spray. The plants treated with 100 and 10 p.p.m. showed no variation compared to control plants as regards the time of ear emergence. However, the plants treated with 10 p.p.m. showed improved vegetative growth compared to the control plants. Results of grain yield also show that the highest yield of 3.43 g. per plant was observed in the case of rice plants treated with the lowest concentration. This indicates the growth promoting action of maleic hydrazide on factors such as number of panicles, length of panicle and number of spikelats formed per panicle.

K.L.R.

FISH

Determination of total volatile nitrogen in cured fish products, by Krishna Pillai, V. and Nayar, M. R., *Indian J. Fish*, 1957, **4** (2), 295.—The amount of total volatile nitrogenous bases is generally an index of the degree of spoilage of fish products. The distillation method is employed for the estimation of the total volatile nitrogen (T.V.N.) The success of this method depends largely on the complete recovery of the volatile bases from the fish-muscle extract when distilled in presence of an alkali. In this investigation, the AA have studied the comparative efficiency of 96 per cent ethyl alcohol and aqueous trichloroacetic acid in extracting the volatile bases from cured fish products and of three alkalies *viz.*, sodium hydroxide, potassium carbonate and sodium borate in completely distilling the bases from the extracts under uniform conditions. The extent of variation in the values of T.V.N. with the increase in the concentration of the fish muscle in each of the extracts on distilling with the above alkalies has also been determined. Results of these studies show that for the accurate determination of T.V.N., it is preferable to prepare an aqueous extract of the fish sample and to use sodium borate as the alkali in distilling off the volatile bases. In the case of alcohol extract, however, there is a definite advantage in that the protein gets precipitated, and the solution remains clear.

K.L.R.

Inhibition of bacteria from marine sources by aureomycin, by Velankar, N. K., *Proc. Indian Aca. Sci.*, 1958, **XLVII** (2), 87.—The use of antibiotics in controlling the bacterial flora of marine products is gaining attention of several workers during recent years. Aureomycin in low concentration has been found to be very effective in retarding the spoilage of fish stored in ice. Because of the fact that aureomycin holds out promise as a preservative for fish, the A. has investigated into the effect of 2, 5, 20 and 50 p.p.m. of aureomycin on the growth of 48 bacterial species isolated from the marine environment and from sea fish. The action of the antibiotic on the bacterial population of sea water has also been studied. Aureomycin was effective in inhibiting the growth in almost all the bacteria excepting two or three species. Approximately 40 per cent of the bacteria were sensitive to the level of 2 p.p.m., 30 per cent to 5 p.p.m. and 30 per cent to 20 p.p.m. Gram-negative achromic rods, *Vibrio*, *Flavobacterium*, *Bacterium* and *Bacillus* were sensitive to 2 p.p.m. Yellow, red and violet pigment producing species as well as the *Pseudomonas* group were sensitive to levels of 5 and 20 p.p.m. cocci were more resistant than gram-negative rods. The d tion of lag before visible gr occurred on agar slopes at temperature varied from ½ to 4 d The bacterial counts of fish on aureomycin containing agar reduced to 1/3 at 2 p.p.m. and 1/25th at 5 p.p.m. level. In t case of sea-water, the count reduced to 1/5th at 2 p.p.m. to 1/20th at 5 p.p.m. levels. higher levels, the count was ze The results imply that use of omycin in ices and in 'initial d for preservation of fish will great enhance the keeping period.

K.L.R.

INSECTICIDES

Studies on indigenous insec ticidal plants: Part II—*Ann squamosa*, by Mukerjee, T. D. Ram Govind, *J. sci. industr. Re* 1958, **17C** (1), 9.—The insecticid properties of the ether extra of *Annona squamosa* seeds ha been examined and compared wi those of D.D.T. and pyret hrins. As a contact poison, the extract is toxic to *Musca nebulo* and *Tribolium castaneum* adults; D.D.T. is 7 an 10 times more toxic than the extract against *M. nebulo* and *T. castaneum* respectively. The extract acts as a stomach poison against the larvae of *Bombyx mori*, but its activity is 10 times less than that of D.D.T. As an ovicide, the extract is toxic to the eggs of *B. mori;* 1 per cent solution of the extract effects 84-86 per cent kill as compared to 96-100 per cent kill effected by 0.04 per cent pyrethrin solution. The extract in additio acts as a repellent. It has poo residual toxicity against *M. nebulo*, the toxicity being negligible 8 days after application.

By treating the ether extract with petroleum ether, an insoluble resin is obtained which is 6 times as toxi as the ether extract, particularly as a contact poison against *M. nebulo.*

MICROBIOLOGY

Synthesis of fat by *As nidulans:* **Part II—Changes in**

the composition of *A. nidulans* fat with nitrogen concentration in the medium, by Jagjit Singh and Ishwar Datt, *J. sci. industr. Res.*, 1958, **17C,** (1), 7.—The formation by *Aspergillus nidulans* in a sucrose medium containing inorganic salts and different amounts of ammonium nitrate (0.15—0.60 per cent) has been studied. The production of fat is maximum in a medium containing 0.30 per cent ammonium nitrate and the fat elaborated contains the largest proportion of saturated acids. The yield of the mycelial mass is highest at 0.60 per cent concentration of ammonium nitrate, though the percentage of fat at this concentration is lower; the component acids of the fat produced contain the largest proportions of oleic and linoleic acids.

A study of certain dehydrogenase activities in a sulfanilamide-resistant strain of *bacillus subtilus*, by Sudha Joshi and Sreenivasan, A., *Proc. Indian Aca. Sci.*, 1958, **XLVII** (2), 70—The dehydrogenase activities of susceptible and sulfanilamide-resistant strains of *B. subtilus* grown in peptone or semisynthetic media have been studied with glucose, glycerol, calcium lactate, sodium pyruvate and ethyl alcohol as substrates. The resistant strain showed a marked decrease in dehydrogenase activities with all the substrates.

The behaviour of the cell-free extracts of susceptible or resistant strains was comparable to those of the corresponding intact cells, indicating that decrease dehydrogenase activities of the resistant strain may not be due to alteration in cell-wall permeability.

OILS AND FATS

Stability of sesamolin in presence of vitamin A acetate in hydrogenated oil (vanaspati), Dane, B. S. and Anantanarayanan, V. P., *J. sci. industr. Res.*, 1958, **17C** (1), 18.—Addition of sesame oil (5 per cent by wt.) and vitamin A acetate (700 I.U. /oz.) to vanaspati has been made compulsory. The stability of sesamolin present in sesame oil in presence of vitamin A is not quite certain, thus leading to the invality of the Baudouin's test. The AA have tried to verify this point by storing samples of vanaspati containing 5 per cent refined sesame oil alone and also samples fortified with vitamin A acetate in glass stoppered bottles kept in darkness for 8 months. Baudouin's test was carried out on the samples at regular intervals and the red colour measured in a Lovobond colorimeter. Vitamin A has also been estimated at these intervals. The results show that if the samples are stored in airtight bottles in the dark, the stability of sesamolin is not affected by vitamin A acetate while on the contrary in the case of samples not fortified with the vitamins, sesamolin is found to deteriorate in some instances. When one bottle was half-filled and exposed to light, the vanaspati had developed rancidity and gave off-flavour. It might be inferred from this that factors causing oxidative rancidity in a fat were also possibly be responsible for the loss of sesamolin as well as vitamin A.

K.L.R.

Detoxification of castor cake, by Ambekar, V. R. and Dole, K. K., *Indian J. Dairy Sci.*, 1957, **10** (3), 107.—Castor cake is mainly used as a manure. It is not used as a protein supplement to livestock as it contains a toxic protein ricin, to the extent of about 1.5 per cent. Like other toxalbumins, ricin has property of agglutinising red blood corpuscles of mammalian blood. This property is, however, lost when the toxic protein is coagulated. Detoxication of castor cake is brought about by chemical treatments and simple processes have been devised for the same. The toxicity of castor cake and detoxicated castor cake has been studied by agglutination test and by feeding experiments. Ricin after coagulation becomes insoluble in water and hence water extract of detoxicated castor cake shows very faint blue colouration with ninhydrin solution as compared to toxic castor cake. This affords a very useful method in ascertaining detoxication. The growth of weanling rats has also been studied by feeding detoxicated castor cake in different proportions.

Determination of component fatty acids of butterfat by low temperature crystallisation and urea complexes, by Saroj Tawde, and Magar, N. G., *Indian J. Dairy Sci.*, 1957, **10** (3), 137.—Considerable work has been done on the composition of butterfat from other countries and similar data on the butterfat from India are very scanty. The AA have studied the fatty acid composition of three *ghee* samples obtained from Belgaum. Unsaponifiable matter was separated from the samples by saponification with alcoholic potash. The resulting soaps were diluted and extracted with ether in which the unsaponifiables dissolve. The residual soap solution was acidified with 50 per cent H_2SO_4 and the liberated fatty acid were extracted with ether. The ether extract was dried under vacuum and used for analysis. The mixed fatty acids were steam distilled to remove the volatile fatty acids. The non-volatile fatty acids were subjected to low temperature crystallisation or urea fractionation, methyl ester fractionation and alkali isomerization. The mode of separation of the fatty acid of the fats have been represented in three charts. The composition of the *ghee* samples have been tabulated. It was found that in all the three samples, the total saturated fatty acids amounted to 63-64 per cent, the chief constituent being palmitic acid accounting for nearly 24-29 per cent. The unsaturated fatty acid fraction constitutes 35-36 per cent of the total fatty acids and oleic acid is the main component varying from 20-25 per cent. The fatty acid distribution was somewhat similar in all the three *ghee* samples.

K.L.R.

PART III (Foreign)

ANALYTICAL

Colorimetric determination of saponin as found in beet sugars, by Bauserman, H. M. and Hanzas, P. C., *J. agric. Fd. Chem.*, 1957, **5** (11), 855.—The unsightly flocculent precipitate that sometimes forms when impure beet sugars are placed in acid solution has recently been studied. A saponin in the beet root, if not removed during the refining process, is responsible in part for this apparently harmless, but unsightly floc. An accurate, rapid colorimetric method has been developed for evaluation of finished sugars and for refinery-control measures. Visual examination of numerous sugars for floc gave results that compared well with the quantities of saponin found.

BIOCHEMISTRY AND NUTRITION

A review of the effects of different carbohydrates on vitamins and amino acid requirements by Harper, A. E. and Elvehjem, C. A., *J. agric. Fd. Chem.*, 1957, **5** (10), 754.—The literature on the effects of different carbohydrates on vitamin and amino acid requirements has been reviewed. A substantial body of evidence indicates that when a less soluble carbohydrate is substituted in the diet for a more soluble one, the requirements for most members of the vitamin B complex and for essential amino acids, reported as a percentage of the diet, decrease. The effect of complex carbohydrate in lowering vitamin B requirements has been related to changes in the intestinal microflora; however, there is no evidence to suggest that such changes influence amino acid requirements. Instead, the lower amino acid requirements appear to be a result of physiological effects on food intake, digestion, or absorption. Thus, although dietary carbohydrate serves primarily as a source of calories, indirect effects of individual carbohydrates may be of considerable nutritional significance.

Separation of egg yolk proteins by paper electrophoresis, by Evans R. J. and Bandemer, S. L. *J. agric. Fd. chem.*, 1957, **5** (11), 868.—Isolated egg yolk proteins differ in properties from preparation to preparation. Proteins of whole unextracted yolk were separated from each other by the ridgepole paper electrophoresis technique of Durrum using a pH 8.6 diethylbarbiturate buffer of 0.05 ionic strength. The proteins were dyed with bromophenol blue and the lipides with Oil Red O. The protein colour was eluted with dilute sodium hydroxide solution for quantitative studies and absorbance was determined at 590 mμ in the spectrophotometer. Fresh egg yolk contained 8.6 per cent livetin, 41.7 per cent lipovitellenin, 46.4 per cent lipovitellin, and 3.3 per cent of other proteins. Extraction with ether changed the electrophoretic behaviour of the proteins so that lipovitellenin was not separated from lipovitellin, probably because part of the lipide is linked to lipovitellenin by a bond that is easily broken by contact with ether even in the cold. Paper electrophoresis offers a method for the study and segregation of egg yolk proteins without prior ether extraction.

CEREALS

Fumigation of agricultural products. XV—Germination and growth of cereals fumigated with methyl bromide, by Lubatti O. F. and Blackith, R. E., *J. Sci. Fd. Agric.*, 1957, **8** (12), 691.—Different varieties of cereals have been fumigated, at each of four moisture contents with one or two doses of methyl bromide. The germination of the seeds was assessed immediately after the treatment and again after six months' storage at 20°. The damage done by the fumigant was distinguished from that associated with storage at high moisture contents by drying a par of each treated batch of seeds af fumigation and before storage.

Barley was the cereal most res tant to fumigation, rye, maize, oa and wheat all being apprecia more susceptible. Rye was th most, and maize the least resista cereal in terms of survival afte damp storage, but damp rye is severely affected by methyl bromid Where different varieties of th same cereal species have been teste no important differences have been found.

The proximate analysis of wheat flour carbohydrates. III—The estimation of the hemicellulose fraction, by Fraser, J. R. and Holmes, D. C., *J. Sci. Fd. Agric.*, 1957, **8** (12), 715.—The composition of the hemicellulose fractions of wholemeal and flours of about 70 per cent extraction in terms of anhydro-arabinose, xylose and uronic acid units has been investigated. It has been shown that the hemicelluloses, on distillation with hydrochloric acid, behave in the same manner as an equimolecular mixture of arabinose and xylose. Xylose is a suitable standard for the distillation process, and the 'xylose equivalent' of a wheat fraction multiplied by 0.97 is a quantitative measure of the hemicellulose present, provided this is not less than 1.8 per cent.

COFFEE

Storage properties of vacuum-packed coffee, by Merritt, M. C., *et al.*, *Food Technol.*, 1957, **11** (11), 586.—Effect of storage temperature and length of storage on can vacuum volatiles as monocarbonyl remaining in the grounds, and flavour acceptance in the brew was investigated in vacuum-packed coffee over a period of 27 months. Vacuum in the cans and the volatile monocarbonyl remaining in the grounds decreased with increasing temperature of storage and length of storage, but tended to reach the equilibrium at approximately one year of storage.

hat a state of equilibrium was eing established between can acuum and volatiles is indicated. lavour comparison of brews preared from stored coffee samples ndicated no significant change had ccurred with time and temperature f storage. Statistical evaluation f flavour score at 27 months by nalysis of variance showed no ignificant variations due to temperature of storage.

B.V.S.

CONFECTIONERY

The manufacture of cream caramels, by Leon, S. I., *Food*, 1958, **27** (317), 53.—Milk protein, lactose, butter fat, fluid whole milk etc., are the main ingredients for good cream caramels. The cooking is usually done by using a large high pressure steam kettle with stirring paddles and the finishing stage is carried out at low heat. The A has given recipes for the manufacture of several varieties of cream caramels. Directions for cooking are also given in detail.

B.V.S.

The manufacture of crunchy filled hard candies, by Leon, S. I., *Food*, 1957, **26** (311), 299.—Methods for making crunchy filled hard candies were developed in America during the early part of the present century to utilise the products of the coconut and vegetable oil refining industry. Proper cooking methods are very important for making this hard candy and the open fire cooking, which involves only kettles and stores, will yield a hard candy of the highest quality. Colouring and flavouring for crunchy filled hard candies should be done with great care and the standard flavours adopted are molasses, peanut butter and peppermint. The author, however, has tried and perfected several other types of flavours and fillings. The ingredients for centre as well as for jacket are given in detail along with the directions for the manufacture of several varieties of candies.

B.V.S.

DAIRY

The effect of storage temperature on the keeping quality of butter, by Pont, E. G., *Refrig. J.*, 1957, **11** (7) 24.—1.182 boxes from 197 churnings of choicest quality Victorian butter were divided in three groups and stored at −12.3°F., +0.5°F and +11.3°F (average actual butter temperatures). The average grade of the fresh butter was 92.98 points. The average grades after 6 months storage were, for butter at 12.3°F: 91.34 points; at 0.5°F: 91.33 points and at +11.3°F: 91.31 points. The differences were not significant. Statistically insignificant differences in quality of a similar order were also observed after 3 months storage. It is concluded that lowering of storage temperatures between 12°F would not result in any improvement in the bulk quality of cold stored butter.

H.C.S.

FERMENTATION

Sorbic acid as a selective agent for cucumber fermentations. III—Evaluation of salt stock from sorbic acid treated cucumber fermentations, by Costilow, R. N., *Food Technol.*, 1957, **11** (11), 591.—Gaseous fermentations by yeasts are often responsible for bloater spoilage of cucumber salt stock. A three-year study on the use of sorbic acid in cucumber fermentations to inhibit yeast growth is reported. This involved a total of 141 experimental fermentations testing sorbic acid concentrations ranging from 0.01 to 0.10 per cent. Salt stock from these fermentations was evaluated with respect to per cent bloaters, firmness and colour. In most instances, sorbic acid treatment reduced the percentage of bloaters, but it did not completely eliminate them. There was no significant effect of the treatments on the firmness and sorbic acid levels below 0.05 per cent did not affect the colour of the stock. However, a definite bleaching was observed frequently with 0.1 per cent and occasionally with 0.05 per cent sorbic acid.

B.V.S.

FISH

Bacterial studies of frozen raw breaded shrimp, by Jerome Kern, *Commer. Fish. Rev.*, 1957, **19** (12), 11.—The total numbers of micro-organisms varied widely in the finished shrimp products examined and in the component raw materials. Only one sample of unfrozen raw shrimp yielded a total count of less than 1,00,000 per gram. There were no samples of fresh or frozen green shrimp with counts less than this number. Both breading and batter mixes contributed significantly to the total number of micro-organisms. Coagulase-positive staphylococci were not detectable in any of the samples purchased in food stores. In all but one sample of unfrozen green raw shrimp obtained directly from the processor, however, coagulase-positive staphylococci were present. Study of the results of coliform and enterococci determinations revealed the latter may be the more reliable indicator of the degree of sanitation practiced during processing. High enterococci and total counts coupled with low coliform counts may indicate a long period of frozen storage of the breaded shrimp prior to retail sale.

The expressible fluid of fish fillets. VI.—Electrophoretic analysis of the expressible fluid of cod muscle, by Connel, J. J., *J. Sci. Fd. Agric.*, 1957, **8** (12), 701.—Electrophoretic diagrams of the expressible fluids of cod muscle have been compared with those of extracts at low ionic strength. A new component has been observed in the expressible fluids and some of its properties examined. Its possible sites in the muscle structure and its bearing on the nature of expressible fluid are discussed.

FRUIT AND VEGETABLE PRODUCTS

Enzymatic browning, reflectance measurements, and effect of adenosine triphosphate on

colour changes induced in plant slices by polyphenol oxidase, by Makower, R. V. and Sigmund Schwimmer, *J. agric. Fd. chem.*, 1957, **5** (10), 768.—Studies on prevention of enzymatic colour formation by adenosine triphosphate were made directly on plant slices by colour difference (reflectance) measurements. Adenosine triphosphate prevented or diminished the colour development in potatoes, apples, avocados, mushrooms and peaches, but had on effect on the intrinsic activity of polyphenol of oxidase enzyme(s). Its effectiveness increased with concentration except when a considerable amount of substrate, such as dihydroxyphenylalanine, was added. The colour-preventing action of adenosine triphosphate differed from that of ascorbic acid in that the latter reduces the quinones formed in the reaction catalyzed by polyphenol oxidase, while adenosine triphosphate as such, is not a reducing agent. A number of organic and inorganic phosphates and other substances were ineffective in preventing enzymatic colour formation in potato.

Effects of processing conditions on the chemical properties of canned sweet potatoes, by Arthur, J. C., Jr., and McLemore, T. A., *J. agric. Fd. chem.*, 1957, **5** (11), 863.—Effects of processing conditions on the chemical properties of Unit I Porto Rico and Goldrush varieties of sweet potatoes were determined. The β-carotene content of the canned potatoes was relatively stable during processing with values of 20 to 25 mg. per No. 2 can of Unit I Porto Rico sweet potatoes and 40 to 45 mg. per No. 2 can of Goldrush. The dry weight of the cooked potato was about 80 per cent sugar, averaging 120 to 150 grams per No. 2 can when packed in 35°-Brix sugar solution, with the Unit I Porto Rico variety containing more sugar than the Goldrush variety. Ascorbic acid content was reduced during processing.

Use of γ-radiation for preventing the sprouting of potatoes by Burton, W. G. and Hunnan, R. S., *J. Sci. Fd. Agric.*, 1957, **8** (12), 707.—γ-Irradiation at doses as low as 3500 γ suppresses the sprouting of potatoes but it may also have harmful effects. After storage for 6 months or more, sweetening rendered the tubers unsuitable for crisp or chip production. After 15 months, a great accumulation of sugar and complete break-down have been observed. Irradiation at 20,500 γ and over increased the initial rate of water loss and subsequent wilting. Irrespective of irradiation there was an apparent direct correlation between the rate of water loss and the cumulative loss which had occurred.

Enzymes in canned stone fruit, their survival and their effect on corrosion of the cans, by Dickinson, D., *J. Sci. Fd. Agric.*, 1957, **8** (12), 721.—Stone fruit—plums, greengages and cherries—which contain β-glucosidase corrode lacquered tinplate cans more rapidly if the heat process used is insufficient to inactivate the enzyme. Heat penetration measurements indicate that the stone offers no peculiar resistance to heat, but nevertheless canning processes which give adequate protection against microbiological spoilage may leave active β-glucosidase, or even peroxidase, in the kernels of the stones. Such residual enzyme activity provides a ready explanation of the abnormally rapid corrosion of cans sometimes encountered in commercial canning. The storage life of fruit in plain cans appears to be unaffected by such activity.

Quick-cooking dehydrated vegetables, by Gooding, E. G. B., *Food Manuf.*, 1957, **32** (11), 513.—Most of the dehydrated root vegetables require lengthy soaking and cooking before they take edible form. The A who has worked on the methods of shortening or even eliminating the soaking time has described here the experimental possibilities of reducing the cooking time also. Experiments were carried out with flakes of carrot, swede, turnip, celeriac and parsnip cut 5/16 × ⅜″ square and with the thickness of ⅛″, 3/32″ and 1/16″. The flakes cooked in steam were then dehydrated by hot air in cross-flow cabinets. Vegetables processed this way were found suitable for direct eating after boiling gently for 5-10 minutes and also in dried soups only if the flakes were of definite sizes. But, by employing the accelerated freeze drying technique, even larger portions of root vegetables were found satisfactory for soups though not for direct eating. Cooked peas, broad beans and green beans dried by this technique gave a very satisfactory product.

B.V.S.

Hollowness in cucumber pickles, by Samish, Z., Dimant, D. and Marani, T., *Food Manuf.*, 1957, **32** (11), 501.—Fermenting cucumbers sometimes develop hollowness or internal cavities which adversely affect the market value of the finished product. The AA have investigated the conditions which promote the formation of hollow pickles or bloaters using a local variety Beth Alfa. Comparative observations are also made with another variety, Ben Shemen. Rate of bloater formation, the relation of size and pricking to the occurrence of bloaters and the effect of varying salt concentrations on bloater formation in brined cucumbers have been discussed. The tendency towards the formation of internal cavities increases with the size of the fruit, the temperature during fermentation and the concentration of the brine. Pricking of the fruit before fermentation or addition of sodium benzoate to the brine reduces the appearance of the hollowness of the pickle. It is suggested that the hollowness is caused by micro-organisms present in the fruit.

B.V.S.

Consumer preference studies on apple sauce: sugar-acid relations, by Dryden E. C. and Hills, C. H., *Food Technol.*, (11), 589.—The higher the sugar content of a sauce, the higher the acidity required for optimum flavour effect. Likewise, the higher the acidity, the higher the sugar required. However, optimum brix-acid ratio was not the same in all tests. Changes in sugar content affect the degree of preference to a greater extent than proportionally equivalent changes in acidity. Data indicate the sauce most preferred to be one containing about 0.45 per cent acid, with a brix value of about 22, that is, with 0.05 per cent more acid and 4 per cent more sugar than the standard sauce chosen for the tests. The panel of tasters employed in these tests was smaller than that usually called for in a consumer-preference test. Facilities for more adequate sampling of the consuming public were not available. However, this work indicates that the quality and uniformity of apple sauce could be improved by regulating the brix-acid ratio.

B.V.S.

Theoretical considerations on the pre-cooling of fruits and vegetables, by Hicks, E. W. *Refrig. J.* 1956, **10** (8), 35.—The case in which the flow of the cooling medium over the individual fruits is so good that each may be treated as freely exposed to it and the case in which there is no air flow into the packages and the transfer of heat within them is purely by conduction; are the two interesting but limiting cases, which can be easily calculated and exact time of pre-cooling could be determined. The author discusses some of the cases in which the temperature histories during pre-cooling can be readily calculated, and it also draws attention to the evidence provided by theoretical analyses on the true nature of practical pre-cooling problems e.g. (*a*) effect of air flow into packages, (*b*) some other effects of package design (*c*) some effects of the design of the stack. For effects of heat of respiration, nett rate of heat production which is heat of respiration minus heat of evaporation, should be considered which is fairly small and negative among fruits like apples and much greater among peas, beans, asparagus etc. In such cases rapid pre-cooling is essential.

H.C.S.

INSECTICIDES

Chemical structure and activity of pyrethrin and allethrin synergists for control of the housefly, by Beroza, M. and Barthel, W. F., *J. agric. Fd. Chem.*, 1957, **5** (11), 855.—In a study of the relationship between chemical structure and synergism for pyrethrins and the related allethrin, the best unit of structure observed was the 3, 4—methylenedioxyphenyl group. More than 200 methylenedioxyphenyl compounds with side chains containing ether, ester, alcohol, acid, acetal, amine, amide, carbamate, phenol, and aldehyde groups were investigated. Compounds with alcohol, carboxylic acid, or acyclic hydro-carbon radicals as side chains did not exhibit appreciable synergism; whereas those with ether, ester, acetal, sulfoxide, sulfone, or amide substituents were most productive of synergism. Few compounds that did not contain the 3, 4-methylenedioxyphenyl group exhibited synergism and most of these were amides. Their activity did not approach the level of activity obtained with the 3, 4-methylenedioxyphenyl compounds.

MARINE PRODUCTS

Effects of temperature upon the storage life of fresh shucked pacific oysters (*ostrea gigas*) by Leibman H. L., *et al.*, *Commer. Fish. Rev.*, 1957, **19** (12), 1.—The paper deals with the study of the effects of good and poor refrigeration practice on the bacterial growth and spoilage during cooling and storage of oysters. Samples of shucked Pacific oysters were packed into friction-lidded glass jars, which were stored at different temperature viz., 33° F, 36° F, 46° F and 53° F for a period of 16 days. Samples were removed from storage at definite intervals and total bacterial count and pH of each sample were determined. The results have been represented on graphs. It was found that oysters stored at 53 °F were rejectable even at the end of 3 to 4 days and those held at 46° F were unacceptable after 7 or 8 days. The samples kept at 36° were still acceptable after 12 days of storage and those preserved in ice were found to be in good condition even after 15 days. It is evident from these findings that lower temperatures of storage approaching that of ice are conducive to the maintenance of low bacterial counts. It has also been observed by the AA that temperature is an important factor with respect to the rate of spoilage of fresh shucked oysters. The results indicate that rapid cooling and lower temperatures (nearer 32° F) prolong the storage life of the product, while slow cooling and higher temperatures help the growth of bacteria, thereby causing rapid spoilage of the product.

K.L.R.

MICROBIOLOGY

Improved medium for assay of thiamine with lactobacillus of fermenti, by Macias, R. and Frank, M., *Appl. Microbiol.*, 1957, **5**, 249.—The paper described a medium which nearly doubles the growth response of L. fermenti in the assay range. In addition to the greater reproducibility of the assay results, the modified medium affords better recoveries of added thiamine. Further, this medium has shown its merit, in that over a period of 6 months not a single depressed assay curve has been obtained. The growth in the blank tubes has been consistently low and no apparent precautions have to be taken to insure these low blanks. Subsequent studies indicate that Tween 80 (1 mg. per tube), although usually not stimulatory, should be included in the medium for several reasons.

H.C.S.

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THE EFFECT OF BAKING ON THE NUTRITIVE VALUE OF FORTIFIED BISCUITS

By V. Subrahmanyan, G. S. Bains, D. S. Bhatia and M. Swaminathan

(Central Food Technological Research Institute, Mysore)

Sweet biscuit is a popular item in the category of baked products and is sometimes recommended by the trade as a valuable source of nutrients for infants and other age groups. Freeland and Bradley[1] recently reviewed the chemical composition and related aspects of 'Biscuits as Food'. Carlson[2] *et al* showed that experimental animals failed to grow when fed on wheat flour Graham-type crackers but better growth and survival was observed in groups fed on crackers fortified with soybean grits. Womack and Marshall[3] reported a low rate of growth (2.0 g. per week) when cookies containing cottonseed flour were fed to albino rats at 7.5 per cent level of protein in the diet. It is now recognised that heat processing adversely affects the quality of protein in cereals and milk.

During recent years, the possibility of fortifying cereal flours with protein-rich specially prepared edible oilseed meals, has received considerable attention[4-7]. A process[8] for the production of expeller deoiled edible meal free from blemishes associated with commercial groundnut cake has recently been developed at the Central Food Technological Research Institute, Mysore. The meal contains 45-50 per cent protein and 8-9 per cent oil. The use of this meal in fortification of various food products, such as macaroni, multi-purpose food[9] and biscuits, etc., is being studied in these laboratories. This paper presents the results of a study on the effect of baking on the nutritive value of biscuits fortified with groundnut flour, vitamins and calcium.

FOOD SCIENCE **APRIL 1958**

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Experimental

The biscuit formula consisted of groundnut flour 25-30; wheat flour 35-40; sugar 18; shortening 15; salt 0.75; calcium carbonate 0.5; glucose 0.5 per cent respectively and the quantities of vitamins incorporated in 100 g. of the mix were: thiamine hydrochloride—2 mg., riboflavin —2 mg., niacin—20 mg., vitamin A-5375 I.U., and vitamin D (as calciferol) 714 I.U.

The biscuits were baked at 450°F for 4-5 minutes.

The biscuits, on analysis, gave the following composition—(moisture free basis); protein 17 per cent, fat 20.2 per cent, calcium (Ca) 0.260 per cent and phosphorus (P) 0.216 per cent.

The influence of baking on the nutritive value of biscuits was evaluated by conducting growth experiments on young albino rats. Two types of biscuits designated as B and C were assayed. In the B type, the groundnut flour prepared according to the method mentioned earlier was used, while in the C type the pre-treated groundnut flour was used.

(The groundnut meal was made into dough with water and then steamed for 5 minutes, granulated, dried and powdered before incorporation in the biscuit. This treatment yielded flour which imparted less stickiness to the dough as compared with the untreated groundnut flour.)

Growth experiments with albino rats using fortified biscuits as the sole food

The biscuits and the unbaked mix were fed for a period of 8 weeks to three groups of albino rats (6 males and 4 females in each group). The grouping of animals was in accordance with the randomised block system, keeping in view similarities of litter, sex and initial weights.

The diets prepared by adding sufficient amount of boiling water to weighed aliquots of dry ingredients were fed *ad libitum*. The left over diets were collected daily, dried and weighed.

Accurate record of weekly diet consumption and gain in body weight was maintained for the duration of the experiment. The results are shown in Table I.

Table I. *Effect of baking on the growth promoting value of biscuits*

Diet	On 6 Male Rats			On 4 Female Rats		
	Average initial weight g.	Average food intake, g week	Average gain in weight g/week	Average initial weight g.	Average food intake g/week	Average gain in weight g/week
A. Control (unbaked ingredients)	44.2	70.9	19.39	44.0	60.9	12.66
B. Biscuits containing untreated groundnut flour	44.5	68.8	16.92	43.7	64.9	13.75
C. Biscuits containing pre-treated groundnut flour	44.8	66.6	15.98	43.4	58.1	11.73
Standard error of the difference of means	...	...	±1.12	...	...	±0.68
Degrees of freedom due to error (d.f.)	...	...	10	...	...	6

Metabolism study: In order to assess the effect of baking on the utilisation of the protein, calcium phosphorus and fat in the biscuits, the male animals of each group were transferred to individual metabolism cages at the expiry of the initial 8 weeks of feeding. The animals were maintained on the respective diets for a further period of 8 days during which urine and faeces were collected separately for each animals. The diet, urine and faeces were then analysed for nitrogen by the Kjeldahl method, for calcium by the McCrudden[10] method; for phosphorus by t colorimetric method of Fiske and Subba Ra fat was estimated by extraction with petroleu ether. The results are shown in Table II.

Table II. *Effect of baking on the utilization of nutrients in biscuits*

Diet	On 6 rats, average daily retention of			
	Fat g/day	Nitrogen mg/day	Calcium (Ca) mg/day	Phosphorus, (P)
A. Control (Unbaked ingredient) ...	1.952	68.1	21.6	15.
B. Biscuits (Untreated groundnut flour)	1.808	57.9	21.6	11.
C. Biscuits (pre-treated groundnut flour)	1.806	65.7	18.5	13.
Standard error of the difference of the means*	±0.089	±5.79	±1.68	±1.0

* Degrees of freedom due to error in each case = 10.

The effect of baking on the quality of protein in the biscuits

The effect of baking on the 'Nitrogen—Efficiency ratio' of the proteins of the biscuits was determined at 10 per cent level of protein in the diet by rat feeding experiments; the unbaked mix was used as the control. The experimental diets which contained adequate amounts of minerals and vitamins but the protein of which was furnished by the baked and unbaked ingredients, were fed to two groups of young albino rats. Each group consisted of 15 animals (6 males and 9 females). As the duration of feeding test has been reported to influence the 'Protein efficiency ratio' of the proteins, the experiment was carried out for 8 weeks. The biological value of the protein has been expressed as 'Protein efficiency ratio' which denotes the gain in body weight per g. of protein intake. In view of the composite nature of flours in biscuits a mean factor of 5.6 was used for conversion of nitrogen into protein. The results have been reported in Table III.

TABLE III. *Effect of baking on the 'Protein efficiency ratio' of fortified biscuits and unbaked composition of ingredients*

Diet	On 5 male rats: Average protein efficiency ratio		On 9 female rats: Average protein efficiency ratio		Average protein efficiency ratio for both sexes	
	4 weeks	8 weeks	4 weeks	8 weeks	4 weeks	8 weeks
1. Control (unbaked composition of ingredients) ...	1.88	1.68	1.91	1.62	1·90	1.65
2. Biscuits ...	1.45	1.26	1.42	1.33	1.43	1.29
Standard error of the difference of means ...	±0.079	±0.079	±0.39	±0.25	±0.30	±0.24
Degrees of freedom due to error ...	5	5	8	8	13	13

Interpretation of results: Fisher's analysis of variance and covariance technique has been applied to evaluate the effect of baking on the growth promoting value of biscuits, the biological value of the protein and the average daily retention of nitrogen, fat, calcium and phosphorus by the adult animals, and the differences in the mean values between two diets were tested by the students 't' test.

Discussion of Results

The data in Table I show that when the fortified biscuit was fed as the sole diet, the differences in the average growth rate of the males as well as the females in various groups fed biscuits and the unbaked materials, are statistically nonsignificant. Although, the regression of gains in weight on food intake was significant, yet the differences in the gain in weight among the three diets, even after adjusting for differences in food intake, turned out to be statistically non-significant.

The effect of baking on the utilization of protein, fat, calcium and phosphorus in the biscuits

Statistical examination of the data in Table II revealed that there was no significant effect of backing on the utilisation of protein, fat, calcium and phosphorus content of biscuits.

The effect of baking on the quality of protein in biscuits

The values of 'Protein efficiency ratio' when computed at the end of four weeks growth period were found to be greater than those obtained at the end of eight weeks (Table III). On the whole, irrespective of the duration of the growth period or the sex of the animals, the 'Protein efficiency ratio' of the biscuits was significantly lower than that of the unbaked ingredients, when the level of protein in the diet was 10 per cent. However, it seems from the results of growth experiment (Table I) wherein the biscuits containing 17 per cent protein constituted the sole diet, and the values (Table III) when the level of protein in the diet was restricted to 10 per cent, that the nutritive value of the baked product, if consumed as such is only slightly less than that of the unbaked composition of the ingredients. The adverse effect of baking on the quality of protein becomes more evident when the level of protein in the diet is reduced to 10 per cent.

Summary

1. The nutritive value of fortified biscuits prepared from a blend of wheat flour, 35-40; groundnut flour, 25-30; sugar, 18; shortening, 15; salt, 0.75; calcium carbonate, 0.5; glucose, 0.5; parts, respectively, and fortified with vitamins A, D, thiamine, riboflavin and niacin, has been studied by rat feeding experiments.

2. The average growth rate of the animals fed on fortified biscuits as the sole diet was almost of the same order as that of the animals fed on unbaked ingredients.

3. Metabolism studies on diets in which the biscuits formed the sole diet have shown that baking did not cause any significant reduction in the utilisation of protein, calcium, phosphorus and fat content of the fortified biscuits.

4. The 'protein efficiency ratio' of the biscuits and of the unbaked ingredients when fed at 10 per cent level of protein in the diet, revealed that baking has adversely affected the quality of protein in the biscuits. The protein efficiency

ratio of the proteins in the biscuits was 1.30 as compared with 1.65 for the unbaked ingredients.

Acknowledgement

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RETENTION OF ASCORBIC ACID IN TOMATO KETCHUP AND GUAVA JELLY DURING STORAGE

By B. S. Bhatia, G. S. Siddappa and Girdhari Lal

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In the course of an investigation of the stability of natural as well as added ascorbic acid in different fruit products[1-6], it was of interest to study it in the case of tomato ketchup and guava jelly. The results obtained are briefly described in this paper.

Tomato ketchup prepared in the usual way was fortified with 100 mg per cent of ascorbic acid and packed in 12 oz. crown cork bottles which were sterilized in boiling water for 30 minutes. Ascorbic acid in the ketchup was estimated by the xylene extraction method after 1, 14 and 23 months' storage at room temperature of 24-30° C. It was estimated in a partially filled bottle also after 14 months' storage. The results are shown in the Table I.

Table I. *Retention of ascorbic acid in Tomato ketchup fortified with ascorbic acid during storage at room temperature of 24-30°C*

Type of fill	Initial ascorbic acid	Retention% at the end of . . . (months)			
		0	1	14	23
Full bottle ...	165.2	100.0	70.4	27.6	17.3
Half-filled bottle	165.2	100.0	...	9.3	...

Guava jelly was prepared in the usual way and packed in lb. glass jars. The surface of the jelly was covered with a layer of paraffin wax and the jars closed with metallic screw-caps. For fortification, 100 mg. per cent of ascorbic acid was added to the jelly before allowing it to set. The two lots of jars were stored at room temperature of 24-30° C and at 37° C. Ascorbic acid in the jelly was estimated by the xylene extraction method[7] after 0, 31 and 57 weeks of storage. The results are shown in the Table II.

Table II. *Retention of ascorbic acid in Guava jelly during storage*

Product	Initial ascorbic acid content mg/100g	Retention% at room temperature at the end of (weeks)			Retention% at 37°C at the end of (weeks)		
		0	31	37	0	31	57
Guava jelly ...	43.2	100.0	36.4	32.1	100.0	9.5	2.7
Guava jelly fortified with 100 mg% of ascorbic acid	136.3	100.0	53.5	37.6	100.0	1.4	0.0

To study if the loss of ascorbic acid was more at the surface layers due to its oxidation by the oxygen present at the top of the jar, ascorbic acid was also estimated in the top, middle and bottom portions of the jelly in an unwaxed jar after 57 weeks' storage at room temperature. The results showed that there was no difference in the values of ascorbic acid in the different layers of the jelly.

Discussion

It will be seen from Table I that retention of ascorbic acid in tomato ketchup during storage is 28 per cent only at the end of about one year's storage. The retention is similar to that in jams and jellies which are not quite good carriers for ascorbic acid[7]. The loss of ascorbic acid is considerably more in partially filled bottles and this is on account of the comparatively large amount of oxygen readily available in the large head-space inside the bottle.

It will be seen from Table II that after 31 as well as 57 weeks' storage at room temperature the retention of ascorbic acid is higher in fortified than in unfortified jelly.

Although about a third of the ascorbic acid is retained in the jelly at the end of nearly one year's storage at room temperate, almost the whole of it is lost even after 31 weeks storage at 37° C. The retention of ascorbic acid during storage is not, therefore, quite satisfactory. Similar observations have been made by Brenner, *et al*[8] who have concluded that although jams and jellies might appear to be the best carriers of ascorbic acid in view of their low pH and protection from oxygen, the loss of added ascorbic acid in these products is so great as to make them unsuitable carriers.

The authors feel grateful to Dr V. Subrahmanyan, Director of the Institute, for his keen interest in this investigation.

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EFFECT OF REPLACEMENT OF RICE IN A POOR VEGETARIAN DIET BY TAPIOCA MACARONI ON THE GENERAL HEALTH AND NUTRITIONAL STATUS OF CHILDREN

One of the most important food problems of India and many other East and South East Asian countries, in general, is the provision of adequate amounts of cereals in the diet to meet the calorie requirements of the people[1]. In certain Asian countries, *viz.*, Japan, Philippines and Indonesia, efforts have been made to make up the calorie deficit by increasing the production and consumption of high yielding tuber crops like sweet potato and tapioca[1]. A similar suggestion for meeting the food deficit in India by the use of a blend of tapioca flour (75 parts) and groundnut flour (25 parts) was made by Subrahmanyan, *et al*[2]. Food in the form of flour, though generally acceptable to wheat and millet eaters, is not readily acceptable to rice eaters accustomed to consuming food cooked in the form of whole grains. Provision of a substitute for rice has therefore become one of the major food problems not only for India but also for the whole Asian rice regions.

Subrahmanyan *et al*[3] reported that rice-shaped grains possessing a chemical composition similar to that of natural rice could be manufactured from a blend of tapioca flour (60 parts), groundnut flour (15 parts) and refined wheat flour (25 parts). In a later publication, Subrahmanyan *et al*[4] found that a poor vegetarian diet based on the rice shaped grains promoted significantly higher rate of growth in albino rats than a similar diet based on raw milled rice. In the above publications, the product has been referred to as 'synthetic rice', but later on, the name has been changed to tapioca macaroni, as the process is essentially similar to that followed in the manufacture of macaroni products from semolina[5]. More recently, the production of rice-shaped tapioca macaroni on a pilot plant scale has been carried out at this institute with a view to ascertain the consumer acceptability of the product on a large scale and to assess its nutritive value as a substitute for rice in the diet of children. The present note deals with studies on the effect of replacing rice in a poor vegetarian diet by tapioca macaroni, on the growth, general health and nutritional status of children.

Rice-shaped tapioca macaroni was prepared on a pilot scale according to the process described by Subrahmanyan *et al*[2]. The chemical composition of the macaroni per 100 g. was as follows: moisture 10.8 g; protein 11.3 g.; fat 1.8 g; fibre 0.6 g; ash 1.9 g; carbohydrate 73.6 g; calcium 53.5 mg.; phosphorus 144.6 mg; iron 3.0 mg; thiamine 0.21 mg; nicotinic acid 3.6 mg; riboflavin 0.07 mg. The method of cooking the tapioca macaroni in the experiment was as follows: Eight pounds of tapioca macaroni were added to 40 pounds of boiling water. The mixture was boiled for 6-7 minutes with occasional stirring. The excess gruel was drained off through a sieve. The cooked macaroni as well as the gruel were given to the subjects along with the remaining diet. Raw milled rice was cooked for about 20 minutes in the above manner to the proper consistency. In this case also, both the gruel and the cooked rice were consumed by the children.

Thirty-two girls between 4 and 11 years who were residents in a boarding home were selected for the study. All the children were free fro diseases likely to interfere with the experimen Initial heights, weights, red blood cell coun haemoglobin level and nutritional status of th children were determined by the methods de cribed by Reddy *et al*[6]. On the basis of initi heights and weights, the children were paired an the members of each pair allotted at random t two groups. The children in the control grou received the usual orphanage diet while for the children in the experimental group, the rice in the diet was replaced by an equal weight of tapioca macaroni. The feeding was continued for a period of six months, at the end of which measurements of height, weight, R.B.C. count and haemoglobin, were made. The children were also assessed for their nutritional status. All the children in the experimental group relished the tapioca macaroni rice and none complained of any digestive trouble during the experimental period.

The results are given in Tables I and II. The data obtained were statistically analysed. It will be seen from Table I that the average increase in heights in both the groups was almost the same. The increase in weight in the experimental group was slightly larger than that observed in the control group, the difference, however, being not significant. A significant difference in favour of the tapioca macaroni group was observed in the increase in the haemoglobin content. The data presented in Table II show that improvement in the nutritional status occurred in a larger number of children fed on tapioca macaroni diet, as com-

TABLE I. *Average values of the initial and final measurements of the children in the control and experimental groups* (16 children per group)

Character	(*a*) Control group (Rice diet)			(*b*) Experimental group (Tapioca macaroni diet)			Difference in the increase (b—a)
	Initial	Final	Increase	Initial	Final	Increase	
Height (inches)	46.56	47 17	0.61	46.85	47.47	0.62	+0.01 ±0.08*
Weight (pounds)	42.19	44.02	1.83	42.42	44.36	1.94	+0.11 ±0.73
Haemoglobin (g/100cc) ...	12.14	11.97	−0.17	11.86	11·99	0.13	+0.30 ±0.11†
Red blood cell count (10^6/cu.mm)	4.28	4.45	0.17	4 32	4.44	0.12	−0.05 ±0.08

* Standard error of the mean based on 15 degrees of freedom. † Significant at P = 0.02.

TABLE II. *Changes in Nutritional Status* of the children in the control and experimental groups at the end of the experiment*

(Duration of experiment: 6 months)

Group	No. of children			
	Improved	Stationary	Deteriorated	Total
Control (Rice diet)	3	11	2	16
Experimental (Tapioca-macaroni diet)	7	9	...	16

* Nutritional status was assessed according to the score card worked out by the Indian Council of Medical Research—Nutritional Advisory Committee (1948).

pared with those fed on the rice diet. The results obtained in the present investigation have shown that (1) it is possible to prepare a rice-shaped tapioca macaroni which will be acceptable to habitual rice-eaters as a substitute for rice and (2) the consumption of tapioca macaroni in place of rice over a period of 6 months did not produce any difference in the general health and growth of children. However the nutritional status of children showed a slightly greater improvement as compared with those fed on the rice diet.

Our thanks are due to Miss K. Indiramma for assistance in the statistical analysis of the data and to the authorities of the Good Shepherd Convent, Mysore for providing facilities for conducting the experiment.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during March, 1958 are given in this section.

S (IS) 8

Studies on the roasting of coffee, by C. P. Natarajan, (*March* 1, 1958). The speaker reported on the work carried out by the Coffee Research Unit on the changes in colour, temperature, roasting loss, density, chemical constituents like caffeine, chlorogenic acid, sugars and the ultraviolet absorbing constituents during roasting of coffee.

For a change in the colour from 7 Y to 4 Y, the finishing temperature changes from 225-240° C, the roasting loss from 15 per cent to 19 per cent, bulk density from 0.60 to 0.55. Robusta beans swell more than that of arabica beans. The medium roast can be obtained at a finishing temperature of 230° C, a roasting loss of 17 per cent and a colour of 5 Y. It is possible to tell the finishing temperature from a given 'Y' of powder and *vice-versa*. The relationships established thus offer a method of defining the colour of different roasts of coffee.

The colour of roasted coffee powder can also be correlated with the colour of brew. The colour becomes more and more insoluble in water below a roast of 4 Y.

Among the chemical constituents, the chlorogenic acid, total sugars decrease as the roasting proceeds. Caffeine remains more or less constant. The water extract increases upto a point and then decreases. Most of the changes narrated seem to change in degree beyond a roast of 5 Y which seems to be a critical point in roasting.

The relationships existing between the ratio of the ultraviolet absorption and colour as well as caffeine chlorogenic acid ratio and colour were also discussed. The mathematical relationship between the two ratios mentioned above for arabica and robusta coffee was reported. A straight line relationship exists between the two ratios.

The difficulties existing in the methods of estimating colouring matter were then discussed and a method which is fairly satisfactory was reported. This consists in analysing the acetone extract of the basic lead acetate precipitate which retains all the colour in brew.

A brief, though lively discussion ensued, where the importance of the roasting process and the need for further studies was stressed. The other points raised were the stability of aroma in different roasts of coffee, roasting in closed space, possibilities of preparing colour charts of various roasts, and flavour evaluation of different roasts.

The President, while complimenting the speaker for his fundamental approach felt that *the practical application of the finding should be stressed with a view to benefit the consumer and the trade*. He further pointed out that the subject should be pursued for standardization of flavour, seggregation of the constituents of aroma, extent of loss of aroma during roasting and extraction, and effect of material of construction of roasters on aroma.

S (IS) 9

The use of growth regulators to improve the cold storage behaviour of fruits, by W. B. Date, (*March* 8, 1958). The speaker observed in the beginning that of recent, the use of Growth Regulators for controlling the portion of plant development is finding increasing use in Western countries. To a large extent, the use of Growth Regulators with regard to temperate fruits is designed to hasten the development and subsequently the ripening of fruits. This is in contrast to the physiological behaviour of tropical fruits which have a tendency to go through the process of ripening very fast. Thus on one hand, the Growth Regulators have been used in temperate regions for hastening the physiological processes, we on the other hand are interested in the use of these chemicals to slow these processes so as to have more time for these perishable commodities during transport, and marketing. Thus an attempt was made to use them in such doses which are not stimulative, with a view to slow down the physiological processes. The stimulative doses of these chemicals are very small as for example between 20-50 p.p.m. as applied in spray solutions at appropriate times. Indication is available in the recent literature that when such chemicals are used in slightly higher doses, it was possible to reduce the loss of green colour and development of certain microbial diseases of citrus fruit during storage. Since oranges and mangoes are important commercial fruits and their producing centres and marketing centres being distantly placed, it was thought imperative that application of Growth Regulators namely 2-4-5-trichlorophenoxy-acetic acid (2-4-5-T) and maleic hydrazide (MH40) in higher doses in the spray solutions either before or after harvest might bring about a delay in ripening, thereby increasing their cold storage life. The experiments conducted for the last two years have been more of a qualitative nature in order to find out whether, the chemical applied at higher doses was effective and if so, what was the suitable type of application? The analytical work in respect of the chemical constituents and the measurement of respiration in terms of CO_2 have not shown greater differences commensurate with the levels of the chemicals used for treating the fruit either before or after the harvest. However, in respect of the two types of examination, we have seen definite difference due to these chemicals. In case of mango fruits treated with chemicals, ripening at a slower rate and an increase in their cold storage life by 8-15 days was observed as against control. In the case of oranges, the retention of the green colour of the peel for a longer time was quite significant than in the case of control, and treated oranges retained their taste i.e., the desirable sugar acid ratio for two weeks more than the control sample.

It is necessary to explain further the list of useful chemicals as also their doses and combinations to ultimately select the combination which would be useful for oranges and mangoes. The experience gained over a period of two years is useful in as much as a definite indication of benefits to be derived by the application of such chemicals has been obtained. During the season 1958-59, he work on oranges has been expanded further and it is also contemplated to undertake similar work on mangoes.

The speaker further observed that recently the plant biochemists have indicated that the phenomenon of ripening is primarily a reaction in which phosphoryation takes place. It may be further interesting to find out by following such biochemical studies, as to how far, we have achieved in delaying the maturity or ripening of mangoes and oranges treated with different growth regulators.

The talk was then followed by an interesting discussion, where various points were raised. It was pointed out that it is necessary to study the post-storage behaviour and microbiological spoilage of fruits, treated by such Growth Regulators. In answering questions regarding toxicity of these chemicals it was pointed out by the speaker that evidence is now available in the literature that the levels at which these chemicals may stay on fruits as residues are not harmful to the consumers but in their questions regarding the hormonal action *vis-à-vis* the chemical nature of the substances, it was explained that certain chemicals belonging to the same group of compounds, are more effective than others. As such these have to be picked up after their trial on the plants.

The President reviewing the discussion observed that the work shows enough promise of a useful method of increasing the storage life of fruits and that it needs to be continued further. As regards certain biochemical studies suggested, it is necessary that such information is investigated into, so as to fill up the gap regarding our knowledge of the types of changes associated with the physiological processes as well as with the delay in ripening.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Colouring of turmeric

E (B & N) 25

I learn that you have developed a new method for the colour processing of turmeric tubers and I shall be grateful if you write to me the details of the same. (Kanpur).

We have been engaged in some work relating to the colour processing and dressing of turmeric (*Haldi*) and have developed a method which eliminates the use of lead chromate for the colour processing. It has been the commercial practice so far to mix turmeric powder with a proprietory product called *Chemichrome* so that a bright yellow colour can be given to the dried turmeric tubers. As the use of lead chromate is now banned, the product obtained by using turmeric powder alone is a little reddish in colour and this is believed to fetch a lower price than the product which has a distinct yellow tinge. We have suggested that if the emulsion containing turmeric powder, castor seed paste and alum (the emulsion used for colouring the tubers) is treated with a little hydrochloric acid and sodium bisulphite, the sulphur dioxide evolved bleaches partially the orange component of the pigments of the turmeric and a product which has a desired yellowish tinge can be obtained. We propose to demonstrate the improved method to turmeric merchants in Erode (Madras State) very shortly. The proposed method does not require any special equipment in addition to what is already being used. The hydrochloric acid and the bisulphite have to be added to the dying paste just before it is applied on to the dried turmeric tubers.

Browning in mango slices

E (F) 26

I request you to send the necessary information on the cause of browning generally observed in mango slices canned in syrup. How can it be prevented? (Manila).

With regard to 'browning in mango slices', referred to by you, we experience no such browning, unless the product is stored at temperatures above 30° C. Of course, slight browning takes place in the fresh slices if these are not immediately used for canning. If the cut slices have to wait, they should be immersed in 2 per cent brine solution. This treatment eliminates this enzymatic browning of the cut slices.

Cold storage of oranges

E (S) 27

We shall be thankful to you if you can furnish us the conditions to be maintained for storing Nagpur oranges in cold store. What will be the cold storage life? (Calcutta).

The optimum conditions for the cold storage of Nagpur oranges are a temperature of 42-45° F and a relative humidity of 85-90 per cent. The approximate cold storage life is 2 months. Fully-grown but green oranges should be preferred over turning or yellow oranges for cold storage.

Manufacture of macaroni

E (IS) 28

We shall be much obliged if you kindly furnish us detailed information about the manufacture of macaroni and spaghetti. (Calcutta).

Macaroni and spaghetti are both classed as 'long' macaroni goods and the best suited essential raw material for their production is wheat semolina, which helps to avoid manufacturing troubles from undue stretching and breaking during the drying process. Long goods can also be made with mixtures of semolina and farina (purified middlings of wheat other than durum) or farina alone.

The various steps in macaroni manufacture are mixing of the raw materials, kneading, pressing and curing or drying. The semolina is mixed with hot water, sometimes salt and other optional substances (such as egg, milk, soy and vegetable products) in large, slow speed mixtures until the granular appearance of the mix is about to disappear. The temperature of water varies from 70-140° F and after mixing for about 10-20 minutes, the mix is put in the kneading machine and the dough is kneaded for 10-20 minutes resulting in a very stiff, plastic mass. The dough is put in the extruding press where it is forced through the die of desired shape (macaroni or spaghetti) at a pressure of 2500-5000 lb. per sq. inch. When the extruded long strands or rods are of desired length, they are cut off and put over sticks which are hung on trolleys. These trolleys are wheeled into the drier and the product is dried uniformly. When properly dried or cured, the macaroni goods contain about 10-11 per cent moisture.

For fuller details about the manufacture of various shapes of macaroni products, you may kindly refer to the book, 'Macaroni Products' by Dr Charles Hummel, published by Food Trade Press Ltd., 7, Garrick Street, W.C. 2, London.

Baking powders

E (IS) 29

We request you to be kind enough to let us know the method of preparing baking powders and the different formulas for the same. (Poona).

Baking powder is essentially a mixture of an alkaline constituent and an acidic constituent. Sodium bicarbonate is most commonly used with cream of tartar (potassium hydrogen tartrate) along with a filler. In recent years, several substitutes for cream of tartar are being used *viz.*, acid calcium phosphate, sodium aluminium sulphate, sodium acid pyrophosphate and mono-sodium phosphate. These are generally diluted with a filler to the same acid strength as cream of tartar and used in the ratio of two parts to one part of sodium bicarbonate.

In the manufacture of bak powders, the ingredients on average consists of 40 per cent acid material, 20 per cent of sodi bicarbonate and 40 per cent filler like rice starch, corn fine semolina, potato starch, lact or dried milk powder. The tuents should be finely pow dry and thoroughly mixed tog The moisture content should be l than 5 per cent and the avail carbon dioxide should not be l than 8 per cent.

The different formulas for baki powder are given below:

1. Cream of tartar—2 lb.
   Sodium bicarbonate—1 lb.
   Corn flour—1 lb.
2. Sodium bicarbonate—70.00 parts
   Calcium acid tetra phosphate—106.25 parts
   Starch—73.75 parts.
3. Sodium bicarbonate—28 par
   Corn starch—27 parts.
4. Cream of tartar—50 parts.
   Tartaric acid—3 parts.
   Sodium bicarbonate—26½ parts.
   Corn starch—20½ parts.

Each ingredient should be well dried before mixing. The mix is packed in air-tight containers.

Enriched biscuits

E (IS) 30

Will you kindly write to us the formula for the preparation of enriched biscuits? How can we prepare the groundnut cake flour? (Gwalior).

The formula for the preparation of enriched biscuits that has been evolved at the Institute is given below:

Wheat maida	180 lb.
Specially prepared groundnut flour	112 lb.
Sugar	80 lb.
Shortening	68 lb.
Salt	1 lb. 14 oz.
Glucose syrup	4 lb.
Baking powder (sodium bicarbonate and ammonium bicarbonate)	10-11
Calcium carbonate	2 lbs. 13oz.
Colour and flavour (mixture of orange, vanilla and raspberry).	suiting requirements.

Note

The shortening used is of a pecial composition having a melting oint of 39-41° C and is stabilised ith a synergised mixture of BHA, ropyl gallate and citric acid. Any f the standard antioxidants like enox-II, Sustane, etc., will be seful for the purpose.

Groundnut flour used in the reparation is prepared as follows:

1. Decorticated kernels are cleaned to remove dirt, stones and shell material.
2. Groundnut kernels are given a light roast.
3. Cuticle is removed by abrasion. This also results in the removal of the germ.
4. The kernels are carefully inspected to remove the shrivelled and spoiled seeds.

Cleaned material is expelled to emove the oil, and the cake btained should contain only 5-7 er cent fat. It is very necessary clean the expeller thoroughly in rder to avoid contamination of the ke with grit. The cake is then owdered to the desired particle ze.

Further one ounce of biscuits hould contain:

Thiamine 0.5 mg., Riboflavin .5 mg., naiacin 5 mg., Vitamin A 500 I.U., Vitamin D 200 I.U.

Canning of prawns

(IS) 31

Please let us know the details of the rocess of canning of prawns. Mangalore).

(1) Fresh prawns must be graded ccording to size. If the prawns are not fresh, a small amount of blackening is going to occur because of sulphite break down. This is brought about by certain enzymes naturally present. Therefore, the quality of prawns is very essential.

(2) Peel the prawns by removing head first and then rest of the shell.

(3) The viscera normally referred to as the 'vein' in case of prawns should be removed by means of a tweezer. In cheaper quality packs the 'vein' is not removed.

(4) Blanch or scald the prawns in 3-5 per cent salt brine for 3 minutes. Sometimes the blanching medium is acidified a little in order to give the prawn better colour and remove alkaline blackishness. This is done especially if the prawns are not very fresh.

(5) Pack 20 per cent more than the drained weight desired per container in S. R. lacquer or fish lacquer tins.

(6) Pour 3 per cent brine into the cans, exhaust and seal. Some firms prefer to acidify the brine slightly.

(7) The process time should be 35 minutes for 8 oz. cans which is the most popular size for prawns. The temperature for processing should be 240° F.

(8) Some processors prefer to blanch the prawns before peeling because it inactivates the enzyme earlier.

Integrated process of extraction of oil

E (IS) 32

We have come to know that a new process has been developed in your Institute for the extraction of oil and separation of the other constituents from groundnuts in a single process. We shall be very much obliged if you can supply us the particulars thereof. (Hyderabad).

The integrated process of extraction of oil from groundnuts is as follows:

Decuticled groundnut kernels are made into a dry paste and the paste is kneaded with alkaline water (20-25 per cent) to displace about two-thirds of the oil in a free state. This oil is decanted. The residue is further diluted with water (7 vols.) and the emulsion is fed into a basket centrifuge to sediment the starch fibre fraction which is later scraped and dried to give the carbohydrate meal. The clarified emulsion from the basket centrifuge is next fed into a super-centrifuge where the remaining amount of the oil (12-15 per cent) is separated in a free state. The protein is precipitated from the skimmed emulsion by the addition of a mineral acid, separated, washed and dried at low temperature.

The above method has an integrated approach to separate all the constituents of groundnut in a single process and is therefore felt to be economical. The oil obtained in the process is of good edible quality and does not need further refining. The protein obtained is also of good quality and can be used for enriching diets, for pharmaceutical purposes (like protein hydrolysates) and for industrial uses. The carbohydrate meal may be used as cattle feed. Attempts are being made to set up a pilot plant to study the actual economics of the process.

BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products.

Price: Re 1.00 (*postage extra*)

Notes and News

STATISTICAL NOTES

All-India Final Estimate of Groundnut, 1957–58

	1957–58 (Final Estimate)	1956–57 (Partially Revised Estimate)
Area (thousand acres)	14,457	13,450
Production (thousand tons of nuts in shell) ...	4,271	4,200

(*Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India*)

NEWS BRIEFS

Fish protein supplement for cereals: Researches are being carried out to find out the possibility of introducing fish protein into the predominantly cereal diets of peoples suffering from *Kwashiorkor* and other protein deficiency diseases. Barnett Sure (Univ. of Arkansas) has found that small amounts of defatted fish flour added to wheat, maize and rice diets produced remarkable improvements in the weight of rats. Addition of 1 per cent fish flour to a rice diet resulted in a 120 per cent gain in weight in 10 weeks and this effect was much greater in the case of wheat flour and maize meal. Maize meal supplemented with 5 per cent fish flour when fed to animals produced astonishing weight gains of 1411 per cent. The protein efficiency of fish flour is far superior to that of dried, non-fat milk solids, dried buttermilk, defatted soya flour, brewer's yeast, food yeast and groundnut meal. The main drawback in the wide use of fish as a protein supplement is its susceptibility to rancidity due to the high fat content. Mr Sure has prepared fish flour of low fat content (0.4) and dried it to 4.6 per cent moisture. It, however, needs to be established whether defatting and drying affect the protein value of the fish meal. (Digested from *Austr. Food Manuf.*, February 5, 1958).

Caramel sauce: Caramel sauce in vanilla and chocolate flavours is now being marketed in eight-ounce glass jars by Kraft Foods Ltd. (Canada). Prepared in liquid form, it is suitable for ice cream, pudding, and dessert toppings, caramel flavouring for milk and many other cooking and dessert uses. (*Austr. Food Manuf.*, February 5, 1958).

New techniques for measuring proteins: Two new methods to measure protein in food products have been recently developed by two scientists in the United States. One method is based on the biuret reaction and the other on excess use of dye. These procedures are rapid, reliable and easy to perform as compared to the long and expensive method of Kjeldahl's which is in current use.

Protein, like the biuret in alkaline solution, reacts with copper ions to give violet colour, the intensity of which serves as a direct measure of protein. The advantage of this method is that only true protein content is measured here and it has been successfully applied to wheat proteins. The principle of the second method works on the reaction of proteins with a known excess Orange G dye (a water-soluble disulfuric acid) to form an insoluble complex. The insolubles are separated by centrifuging and the concentration of unbound dye in the clear solution is measured in a colorimeter. The protein content of the product and the concentration are correlated and as such, the protein can be determined. This technique has been successfully applied to wheat and barley products and on dry and whole milk. The above techniques will be of great interest in grain and flour selection, and quality control of other food products. (Digested from *Chemical Age*, February 8, 1958).

Milk 'pasteurised' by centr ging: In Germany and other E pean countries, attempts are be made to substitute centrifugal fo for commercial pasteurisation a method of reducing the bacte counts of milk.

Employing a unit with ra capacity of 3,500 litres per hour developing centrifugal force app ximating 16,000 g., 95-98 per c of total bacteria present in raw m were removed. Test was conduct with milk preheated to 123° When the temperature was incre ed to 140-160° F., reduction bacterial numbers was increased s further.

The centrifuged milk was tremely low in spore-forming b teria. This is attributed chiefly their comparatively high specif gravity (*B. subtiles* 1.105, spor 1.115). Unit had a suspende bowl and it is estimated that th milk was exposed to centrifug force for about one second.

After $2\frac{1}{2}$ — $2\frac{3}{4}$ hours, effective ness fell off due to accumulation slime in the bowl. The problem c de-sludging without stopping th centrifuge has to be sloved. (*Indi Dairyman*, January 1958).

Fruit bars from dehydrate apple flakes: Compressed app bars were made from apple flak whos moisture had been adjusted t 12 per cent. Of three binding agent used, sorbitol, invert syrup and 7 apple syrup concentrate, the appl concentrate at the rate of 3 ml. t one ounce of apple flake, made th most satisfactory pressed bar. (*F Technol. Austr.*, February 1958).

De-oiling of peanuts: R. K Willick and R. O. Feuge, of th U.S. Department of Agricultu Southern Regional Research Lab ratory, New Orleans, La., hav described conditions for freeing from whole, blanched peanuts by method which involves soaking th peanuts at ambient temperatures a suitable solvent, such as isopent ane or hexane. After removal the solvent by stripping with

or from 4 to 16 hours, the de-oiled
r partially de-oiled peanuts resem-
led ordinary peanuts in appear-
nce and flavour, although the fla-
our was milder. The fact that the
le-oiled peanuts are relatively low
n caloric value suggests that the
roduct may be desirable as a
ew food. (*Food Technol. Austr.*,
ebruary 1958).

Oxygen test for determining
helf-life of fat-containing foods:
method for determining the shelf-
fe of fat-containing foods which is
tated to be fast and more accurate
an the present 'Schaal oven' and
ccelerated oxygen' methods, has
een devised at the Food Laborato-
es of Eastman Chemical Products,
nc.

In what is known as an oxygen
omb test, a weighed sample is
laced in a bomb which is purged
ith oxygen, then charged with
xygen at 50 or 100 lb. p.s.i. The
omb is then placed in a 212° F
ater bath. A recorder charts the
rogress of the test from an initial
eak pressure, ending when a pres-
ure drop of 2 lb. or more is observ-
d during two consecutive 1/4 hour
eriods. In some cases, other end
oints may be used.

According to Eastman, the test
somewhat more accurate than the
ctive oxygen' method and very
uch more accurate than the
Schaal oven' method for judging
t stability. The method has a
onstant error, whereas the other
ethods vary directly with the
ability of fat.

The test is claimed to be very
uch faster than the others and no
pecial skill is required for the
chnician running it. (*Food*
Ianuf., December 1957).

Edible protein from soyabeans:
new $ 4,000,000 edible protein
ant will be erected at Indianapolis,
diana, by the Glidden Company.
he new protein product, which
ill be derived from soyabeans, is
be marketed under the trade
ame 'Promine'. When incorpo-
ted into staple foods, it is claimed,
will build up protein level to
gher nutritive standards and imparts many desirable physical characteristics. (*Food*, January 1953).

DRAFT INDIAN STANDARDS

Baking powder: Baking powder finds wide-spread use as a 'chemical leavener' of dough for bakery products. The constituents of baking powder are (1) sodium bicarbonate, (2) edible starches, and (3) acid reacting components. Baking powder produces carbon dioxide, on wetting, by the action of acid reacting components on sodium bicarbonate.

The efficiency of baking powder depends on the amount of carbon dioxide available on wetting and hence a test has been specified to determine the 'available carbon dioxide'. Besides this, tests to determine poisonous elements like arsenic, lead, copper, zinc and tin as well as methods of sampling have been specified. In the draft standard, a list of chemicals which can be used as acid reacting component has also been given.

In the preparation of this draft standard, the Sectional Committee kept in view the need for providing an agreed and comprehensive specification for baking powder in this country as well as the need for international co-ordination. It has also given due weightage to the relevant rules issued by the Government of India under the Prevention of Food Adulteration Act, 1954. (*ISI Bull.*, November 1957).

Pearl barley and barley powder: Pearl barley is manufactured from barley grain by a process of gradual abrasion, first of the husk and then of the outer portion of the kernel, till the grains are rounded and become pearly. Barley powder is made by roller milling of pearl barley, barley grits and barley grains, and is sometimes obtained as a secondary product in the manufacture of pearl barley. It is comparatively a much finer product than the whole meal barley flour (popularly known in Hindi as *Jau-ka-atta*).

In the above context two draft Indian Standard Specifications covering the following items have been prepared:

(1) Pearl Barley, and
(2) Barley Powder.

Both these draft standards specify requirements for moisture, total ash, acid insoluble ash, protein, chloroform extractives, crude fibre and alcoholic acidity. In addition to these requirements, the grain size, barley grain content and damaged grains for pearl barley, and microscopic appearance and granularity for barley powder have also been specified in the draft standards. Besides, they also specify the method of sampling and testing for these requirements. (*ISI Bull.* November 1957).

PATENTS (Indian)

57268. *Process for the preservation of sweet toddy (Neera) obtained from palm trees:* Adding 'Paludrine', Trade Mark for N'-p-chlorophenyl N-5-isopropyl biguanide to Neera. —Patented by Council of Scientific and Industrial Research (*Res. and Ind.*, December 1957).

59133. *Process of manufacture of vitamin B_{12}:* Wherein culture medium contains lactic acid liquor prepared from jaggery or molasses as essential ingredient.—Patented by Karamchand Premchand (P) Ltd. (*Res. and Ind.*, December 1957).

Foreign

2,809,113. *Protein from milk waste* (U.S. Oct. 8, 1957): Conversion of high lactose food wastes such as cheese whey, skim milk, corn steep liquor, cannery or citrus wastes, to high protein materials suitable for animal foods is the object of this patent. It is accomplished by an aerobic fermentation employing a lactose-assimilating organism to oxidise the lactose to CO_2 and increase protein content of the mix. Fermentation is carried out at a pH of 3.5—7.5 and temperature of 80°—100° F. over a period of at least 5 days. Then

4

mixture is heated to release cells which are concentrated to 30 per cent solids and spray dried. (*Food Engg.*, January 1958).

2,809,895. *Solid flavouring composition* (U.S., Oct. 15, 1957): Protection against oxidation and preservation of aroma and flavour are the advantages claimed for a patented process for producing a solid emulsion of essential oils useful in flavouring foods. As a specific example, cold-pressed orange oil was stabilized and added to corn syrup at 240° F. Moisture in the corn syrup had previously been adjusted to 3.0—8.5 per cent. Mixture was agitated for 5 minutes in steam-jacketed mixer, poured into thin sheets and cooled to solidification. Then it was ground to 20 mesh size, washed with isopropanol and vacuum-dried. (*Food Engg.*, January 1958).

780,333. *Flavouring:* An emulsion of pure fruit juices, pectin and minor proportions of malt, ascorbic acid and/or lactic acid and lecithin is used to improve the flavour, texture and appearance of goods made from flour, such as bread, rolls, cakes, etc., and of sugar confectionery such as toffee, caramels, fudge, etc.—Patented by A. T. Früs-Andersen. (*Food Trade Rev.*, October 1957).

781,062. *Cereals:* Relates to a method of preparing a pre-cooked oat product: the object is to solve the problem of pre-cooking cereals, drying them, and then have them reconstitute rapidly in water without loss of flavour, palatability or granular identity—Patented by Guardite Corporation. (*Food Trade Rev.*, October 1957).

780,097. *Peanut foods:* Oilcakes prepared from peanuts have been used as cattle food principally because they are too unpalatable for use as human food. A method for preparing a food product for human consumption from peanuts is based on the complete removal of the red skins of the kernels.

The kernels are washed and rapidly dried. This cracks the red skins which can then be removed from the kernels by an air stream, after which the kernels are roughly crushed and again subjected to an air stream to remove any remaining skins and germs. Washing may take place in an apparatus comprising a Archimedean screw, so as to humidify only the red skin surrounding the kernel; drying is commenced in a rotary drier.

The cleaned and dried ke are then fed to expellers, which steam treatment disintegrate cell tissue and oil is extracted i usual way. Pressure is very gradually to avoid any ex sive heating.

The cake is reduced to a powder by supersonic crushing roasted for a few minutes at to 120° C. This results in desi tion and re-agglomeration of product into granules. Am acids, inorganic salts, sugar, sodi glutamate, salt or certain flavo may be added if required—Paten by G. Calil and M. Guern (*Food Manuf.*, October 1957).

C.F.T.R.I. NEWS

The following distinguished p sonalities visited the Institute d ing March 1958.

Mr W. Y. Oakes, Labour Co missioner, Madhya Pradesh.

James Vincent Shroan, Americ Author and Journalist.

Dr Banerjee, Chief Medical Of cer, Hindustan Lever Bros., Bon bay.

Her Excellency Alva Myrd Swedish Ambassador in Indi New Delhi.

Mme. Julie Mellock, Executi Director, Public Interest Inc., N York City.

FOOD AND POPULATION AND DEVELOPMENT OF FOOD INDUSTRIES IN INDIA (*published in July 1952*) pp. xv + 357.

This book brings together the views and suggestions of leading thinkers, industrialists, scientists, demographers and other experts on the two topics. Packed with up-to-date technical and statistical data on several food industries such as fruit preservation, biscuit, chocolate, confectionery, glucose, flour-milling, food yeast, vanaspati, edible oils, fish processing, food machinery and the refrigerated preservation of perishable foods, this authoritative document brings into relief the handicaps and potentialities of these Industries in India. An appendix embodying the recommendations of a Committee of Experts, and a comprehensive index enhance the usefulness of the book.

Price: Indian, Rs. 5.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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DIE NEUE VERPACKUNG

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

Effect of vanillin on stability f vegetable shortening, by Narayanan K. M. *et al.*, *Food Sci.*, 957, **6** (11), 245.—The effect of anillin on the stability of vegetable hortening (m.p. 37° C) was studied nder accelerated conditions of torage at 100° ± 2° C by chemical nd organoleptic tests. Vanillin as been found to possess antixidant properties when incorporatd in the shortening. The intererence of vanillin in the Kreis test as been observed, whereas there as no interference in the deternination of peroxide values by e iodometric method.

Studies on the composition, torage and nutritive value of alm oil, by Krishnamurthy, K., *al.*, *Food Sci.*, 1957, **6** (11), 248.—he present investigation deals with udies on the relative stability and utritive value of refined and deodosed palm oil, and palm oil blend compared with hydrogenated groundnut oil. The physical and chemical constants and carotene content of the three samples of fat were determined. The keeping quality of the palm oil and the blend was nearly the same as that of hydrogenated groundnut oil. Addition of butylated hydroxyanisole (0.02 per cent) and propyl gallate (0.01 per cent) along with citric acid (0.005 per cent), enhanced the keeping quality of the different oils. No significant difference between the growth-promoting value of the three samples of fat was observed. Palm oil blend and hydrogenated groundnut oil were found to be almost completely digestible in rat. No significant difference was observed in the amount of calcium and phosphorus retained by different groups of rats fed on diets containing palm oil, palm oil blend and hydrogenated groundnut oil.

Estimation of organic sulphur in asafoetida, by Sastry, L.V.L., *J. sci. industr. Res.*, 1957, **16 B** (11), 508.—A photometric method for the determination of organic sulphur in asafoetida has been described. The procedure involves reduction of an aqueous emulsion of the sample with zinc and sulphuric acid and subsequent reaction of the hydrogen sulphide formed with p-amino-dimethyl-aniline hydrochloride to form methylene blue in the presence of ferric ammonium sulphate.

Studies on the packaging of walnut kernels, by Murthy, H. B. N., *et al.*, *J. sci. industr. Res.*, 1957, **16** A (12), 570.—The suitability of different packaging materials for the packing of walnuts has been studied under different conditions of temperature and relative humidity. Polyethylene film of 300 gauge, on account of its insect and moisture-proof properties and amenability to fumigation after packaging, is the most suitable material for packaging walnut kernels.

PART II (Indian)

IOCHEMISTRY AND UTRITION

Studies on the role of methione in the matabolism of tryphane by rats treated with arbon tetrachloride, by Banere, S. and Chattopadhyay, D., *dian J. med. Res.*, 1957, **45**(4), 1.—Different groups of rats ceiving 100 mg. tryptophane in eir daily diet were injected with rbon tetrachloride with or witht the simultaneous injection of ethionine. Urinary excretions of cotinic acid, quinolinic acid, N-ethyl nicotinamide and creatinine ere estimated before and after ese injections. Livers and small intestines of rats injected with carbon tetrachloride, injected with carbon tetrachloride and methionine and of rats receiving no such injections were analysed for nicotinic acid, total fat, free chlolesterol and esterified cholesterol. Carbon-tetrachloride poisoning diminished the urinary excretions of nicotinic acid, quinolinic acid, N-methyl nicotinamide and creatinine and these excretions did not change significantly if the rats were given simultaneous injection of methionine. Carbon-tetrachloride treated rats had diminished nicotinic acid and increased fat and cholesterol contents of liver. When the rats received simultaneous injections of methionine, nicotinic acid contents of liver increased and fat and cholesterol contents of liver decreased. Intestine did not show any change. The normal urinary excretions of some of the metabolites of tryptophane and nicotinic acid by rats fed tryptophane, when the poisoning action of carbon tetrachloride on liver was counteracted by methionine, indicate further that liver may be the principal site for the conversion of nicotinic acid from tryptophane.

Studies on the nutritional status of students of the Eden Hindu Hostel attached to Presi-

dency College, Calcutta, by Banerjee, S. and Biswas, D. K., *Indian J. med. Res.*, 1957, **45** (4), 537.—Nutritional status of 51 students living in the Eden Hindu Hostel, Calcutta, was investigated. The study included the determination of the haematological picture, basal metabolic rate, vital capacity, different body measurements, blood ascorbic acid, plasma alkaline phosphatase activity, blood sugar, blood cholestrol, blood inorganic phosphorus and total plasma proteins. The values obtained were as follows: Red blood cells—4.83 millions per c.mm. blood; leucocytes-6,150 per c.mm. blood; haemoglobin-14.83g. per 100 c.c. blood; packed cell volume—45 per cent; mean corpuscular volume—92.6 cu. μ; mean corpuscular haemoglobin—$30.5\gamma\gamma$; mean corpuscular haemoglobin concentration—33.02 per cent; erythrocyte sedimentation rate—14.4 m.m. per hour; total plasma proteins —8 per cent; inorganic P—3.6 mg. per 100 c.c. plasma; blood glucose —90 mg. per 100 c.c.; total cholesterol—155 mg. per 100 c.c. blood; free cholesterol—73 mg. per 100 c.c. blood; plasma alkaline phosphatase activity—4.5 Bodansky units; blood ascorbic acid—0.97 mg. per 100 c.c. blood; blood dehydroascorbic acid —0.05 mg. per 100 c.c.; height—166 cm.; weight—107 lb. chest at rest—32 inches; chest expansion during inspiration—1.5 in.; rate of respiration—19 per minute; pulse rate—68 per minute; body temperature—98° F.; vital capacity—3.14 liters and basal metabolic rate—33.83 calories per sq. m. body surface per hour.

Blood picture of students was normal. They had normal vitamin C and D nutrition. Respiratory circulatory and alimentary systems were normal. Their carbohydrate, protein and fat metabolism of the body were normal.

Studies on blood cholesterol levels of healthy men of different socio-economic groups in India, by Gopalan, C. and Ramanathan, K. S., *Indian J. med. Res.*, 1957, **45** (4), 593.—Estimations of blood cholesterol concentration were carried out on 447 clinically healthy men belonging to different socio-economic groups in India. The subjects of high socio-economic group revealed a higher level of blood cholesterol than those of the poor group, specially in the advanced age period. This difference was also associated with difference in the fat intake of the two groups. Sepoys, similar to the high socio-economic group with regard to fat and caloric intake, but similar to the poor socio-economic group with regard to the factor of physical exertion exhibited a blood cholesterol pattern akin to that of the poor socio-economic group. The significance of the above observations is discussed in the light of the available evidence regarding the incidence of coronory heart disease in the different groups.

Nutritive value of vegetable protein—Part I—Protein efficiency ratios of cereals and pulses and the supplementary effect of the addition of a leafy vegetable, by Phansalkar, S. V., Ramachandran, M. and Patwardhan, V. N., *Indian J. med. Res.*, 1957, **45** (4), 611.—The protein efficiency ratios (P.E.R.) of some common cereals and pulses have been re-evaluated at 10 per cent level of protein intake observed over four weeks in weanling albino rats. The effect of incorporating a pulse and/or a green leafy vegetable like amaranth without altering the total protein intake has been studied. The following observations were made: (1) Among the leafy vegetables studied, only amaranth when incorporated at the level of 1 per cent protein, improved the P. E. Ratio of *bajra*, wheat, *jowar* and Bengal gram. (2) Pulses when added to the diet to provide 3 per cent protein to 7 per cent protein derived from cereals improved the P.E. Ratio of the cereal proteins, except of that of rice. (3) Amaranth when incorporated at the level of 1 per cent protein at the cost of cereal protein maintained the high P.E. Ratio of cereal-pulse mixtures. (4) The omission of vitamin mixtures from the experim diet did not appreciably lowe P.E.R. of proteins in a cereal-p amaranth mixture. (5) The ous vegetable protein mixt tried in this investigation capable of maintaining the ave normal levels of haemoglobin plasma protein in the bloo albino rats. (6) It is, theref concluded that it is practicab obtain through a proper comb tion of vegetable foodstuffs pro mixtures of high biological comparable with skim milk pro as judged by their protein effici ratios and the maintenance of n mal levels of haemoglobin plasma protein in albino rats.

CEREALS

Amino-acid composition Indian foodstuffs—Part III Threonine and arginine conte of some cereals, by Balasub manian S. C. and Ramachandra M., *Indian J. med. Res.*, 1957, (4), 623.—Threonine and argini contents of five common Indi cereals *viz.*, rice, wheat, *rag* *cholam* and *cambu* have been dete mined by microbiological ass using *Streptococcus faecalis* R the test organism. The values fo the other six essential amino-acids these cereals were reported by t AA earlier. The analysis h been made with several varieties each of the cereals. The threoni content ranges from 0.12 in the ca of *ragi* to 0.519 per cent in the ca of *cambu*. On crude protein ba (16 per cent nitrogen basis), th threonine content is about 3-4 p cent, wheat containing the lea 2.6 per cent. Among the cere studied, rice is found to be rich arginine as compared with othe The average arginine content of t cereal proteins are: rice 10 per ce *cambu* 8.1 per cent, *cholam* 6.9 p cent, *ragi* 6.1 % and wheat 5.2 p cent. The values for arginine somewhat higher than most p lished values. Data on the reprod cibility of the values in independe assays, recovery of amino-acid ad to the sample and its hydrolysate to show that the method is reli- le. The values calculated from fferent assay levels are in good reement.

K.L.R.

SH

Studies on thiaminase from sh—Part I—Properties on thia- inase, by Deolalkar, S. T. and amala Sohonie, *Indian J. med. Res.*, 957, **45** (4), 571.—Thiaminase is und to be present in all the varie- es of fresh water, brackish water d salt water fish under investiga- on. The results indicate that the esence of thiaminase in salt water h is not so uncommon as it has en thought to be. The method extraction of the enzyme was andardized. Mincing was found be better than grinding. The action of thiaminase proceeds ith almost the same rate at 28° C. d 37° C.

Three varieties of fresh water h were examined and it was found at thiaminase exhibits larger acti- ty at pH 7.0 than that at pH wer than 7.0, thus indicating the esence of only one thiaminase in esh water fish. The enzyme from ackish and salt water fish exhibits timum activity at two different H (*viz.* 3.6 and 5.6), thus sugges- g the probable simultaneous pre- nce of more than one thiaminase. ll the three thaiminases are un- able at most acid and alkaline pH. ll the three thaiminases are in- tivated in 24 hours at 28° and in hours even if stored at 4°. ver, spleen, kidney and viscera e rich sources of all the thiami- ses, white grills, heart, gall adder, brain and muscles are poor thiaminase content. The three iaminases (from fresh, brackish d salt water fishes) lost on dialysis major part of their activity. The tivity, however, could be restored all the three cases by the addition boiled original extract. The co- zymes from fresh, brackish and lt water fishes have been found to interchangeable. Manganese d cobalt activated thiaminase 6 and thiaminase 5.6 but not thiaminase 7.0. None of the metals tested could restore the activity of thiaminase 7.0 from all the three sources.

Studies on thiaminase from fish—Part II—Effect of certain compounds on thiaminase activity, by Deolalkar, S. T. and Kamala Sohonie, *Indian J. med. Res.*, 1957, **45** (4), 587.—Effect of certain aromatic amines (from salt water fish—*Coilia dussumieri*) on thiaminase activity was studied. It was observed that a number of amines activated thiaminase activity. On deamination aniline as well as the original boiled extract lose part of their capacity to activate thiaminase. The results indicate that NH_2 group is responsible for the activation of thiaminase.

The amino (NH_2) group from the amino acids does not activate thiaminase activity.

FRUIT AND VEGETABLE PRODUCTS

Fruit-rot disease of *Momordica dioica* **Roxb. due to** *pythium aphanidermatum* **(EDS) Fitz,** by Sharma, O.P. and Asthana, R. P., *Sci. and Cult.*, 1958, **23** (8), 435.—Fruits of the plant, *Momordica dioica* Roxb. belonging to the family of Cucurbitaceae are used as a vegetable. Many of the fruits during the season are found rotting and the AA have isolated a fungus, *Pythium aphanidermatus* (Eds.) Fitz as the disease-causing organism. The nature of the disease is such that first, brownish water soaked spots appear on the fruits, the spots later develop rapidly and cover the whole fruit. The wall of the fruit becomes soft and pulpy and the whole fruit shrinks with a white mycelial growth on the outer surface. The characteristics of the fungus have been studied and reported. The fungus when inoculated on healthy fruits, produce brown spots within 24 hours and the entire fruit is affected within 48 hours.

K.L.R.

MICROBIOLOGY

The utilization of some p-aminobenzoyl peptides by *Streptococcus faecails* **and** *lactobacillus*, by Pal, P. R., Banerjee, B. N. and Guha, B. C., *Ann. Biochem. exptl. Med.*, 1957, **17** (5), 151.—Earlier investigations have shown that micro-organisms require one or more peptides for their growth and when amino-acids are used alone, the growth is slow. To verify the correctness of such a generalisation, the AA have studied the comparative utilizability of some p-aminobenzoyl peptides and the respective amino acids on two micro-organisms *viz.*, *Streptococcus faecalis* R and *Lactobacillus arabinosus* 17-5, A.T.C.C. No. 8014. p-aminobenzoyl derivatives of six amino acids, alanine, phenylalanine, glutamic acid, methionine, valine and tryptophan have been synthesised by the AA and used in the experiment. The effects of the amino-acids and the corresponding peptides on the growth of the micro-organisms have been studied by carrying out four different sets of experiments designed as follows: (*i*) amino-acid omitted from the basal medium (*ii*) basal medium without the amino acid but with the corresponding peptide (*iii*) basal medium containing both and (*iv*) basal medium with the complete amino-acid mixture. Growth of the micro-organisms after 18 hours and after 70-72 hours have been determined. The results show that most of the peptides are not utilized by the two organisms and these cannot replace the corresponding amino acids. Only *S. faecalis* could utilize p-aminobenzoyl methionine to the same extent as methionine itself while *L. arabinosus* could utilize p-aminobenzoyl alanine to a small extent. The implications of these findings are discussed.

K.L.R.

Studies on the nutrition of lactic acid bacteria—Part II—Vitamin requirements, by Nambudripad, V. K. N., *et al.*, *Indian J. Dairy Sci.*, 1957, **10** (3), 157.—

The nutritional requirements of 57 cultures of lactic acid bacteria (including streptococci, leuconostocs and lactobacilli) for vitamins of the B complex group have been studied. The streptococci as a group required at least three vitamins—pantothenic acid, nicotinic acid and biotin—as essential nutrients for growth. Thiamine, p-aminobenzoic acid and cyanocobalamine, on the other hand, were not essential. Considerable variations were exhibited by the different strains in their demand for folic acid and pyridoxine. All the leuconostoc strains demanded pantothenic acid, pyridoxine, nicotinic acid, and biotin; p-aminobenzoic acid and cyanocobalamine exerted no influence on their growth. Lactobacilli seemed to be less exacting in their vitamin requirements because most of the strains required only four vitamins, namely, riboflavin, pantothenic acid nicotinic acid and biotin, for initiation of growth. None of them demanded an external source of thiamine, p-aminobenzoic acid and cyanocobalamine. The requirements for pyridoxine and folic acid were variable.

OILS AND FATS

Nutritive value of high acidity ghee, by Saroj Tawde and Magar, N. G., *Ann. Biochem. exptl. Med.*, 1957, **17** (5), 177.—*Ghee*, available on the market contains large amount of fatty acids and the effect of feeding normal, low acidity and high acidity *ghee* on the growth of albino rats has been reported in this study. The rats were divided into three groups of six each and were maintained for four weeks on a diet composed of 25 per cent fat (*ghee*), 10 per cent casein, 60 per cent cane sugar, 5 per cent salt mixture and supplemented with vitamins. Growth rates and daily food intake were recorded. The nature of fatty acids and the iodine value of blood samples collected from the heart of the rats after the experimental period were determined. The livers and muscles of the rats were also analysed for fat, pospholipid contents, I.V. of fat and saponification equivalent. The chemical constants of the *ghee* samples and results of the experiment are given in tables. It is found that there is not much difference in the nutritive value of the high acidity *ghee* diet when compared to that of the control diet.

K.L.R.

Vitamin A in dairy products—Part VII—Relative heat stability of synthetic vitamin A in oils and fats, by Sampath, S. R. and Anantakrishnan, C. P., *Indian J. Dairy Sci.*, 1957, **10** (3), 147.—Several workers have reported the loss of vitamin A when *ghee* and fortified hydrogenated fat are heated or subjected to deep frying operation. The AA have in this paper reported comparative heat stability of added vitamin A in *ghee*, vanaspati and edible oils, *viz.*, cocoanut, groundnut, refined and sesame oils. The peroxide development of these products has also been determined at intervals of 5, 10, 15, 20, 25 and 30 minutes during the course of heating. The peroxide development was rapid in *ghee*, vanaspati and all oils except cocoanut oil, in which case the peroxide value at the end of 15 minutes of heating was only 1.1, while in others, it was about 11.5-14.4. The influence of the addition of two antioxidants, butylated hydroxyanisole (BHA) and ethyl gallate at 0.02 per cent level to the samples on the development of peroxide at different intervals during heating has also been studied. It is found that the antioxidants reduce considerably the peroxide development and percentage loss of vitamin A in all the cases except cocoanut oil, where only ethyl gallate exerts a pronounced effect particularly after 15 minutes of heating. Addition of varying amounts (0.2-5.6 per cent) of BHA to vanaspati does not have any significant effect in reducing the peroxide development. Synthetic vitamin A acetate was added to vanaspati and oils, which were later subjected to heating. Vitamin A was estimated at definite int during heating. The results that loss of natural vitam present in *ghee* was much more than the loss of added vitam in vanaspati and oils. The sence of an antioxidant help considerably reducing the perc age loss of added vitamin A d heating and the vitamin is m stable in *ghee* as compared vanaspati and oils.

E.L

Studies on the solvent extr tion of cottonseed oil by diff ent solvents, by Rao, G. Chandrasekharan, K. and Mur K. S., *Indian Oilseeds J.*, 1958 (1), 18.—The rate of extract of cottonseed oil from cottons flakes with four different solve *viz.*, commercial n-hexane, pega 1222, S.B.P. spirit 62°/82°C a absolute alcohol has been determi ed by the AA. The oils obtain by extraction with different solven have been analyzed with a view assessing the quality of the o 175 g. of cottonseed flakes we packed in the extractor column an the solvent was circulated throu it at a rate of 55 c.c. per 5 minute The oil extract was collected a intervals of 5 minutes for a perio of one hour at constant roon temperature (82°F). The solven from the extract was evaporate and the weight of oil obtained a each interval was determined. Th total oil content in the cottonsee flakes was estimated by soxhle extraction method with each solven The values for the percentage o residual oil to be extracted hav been plotted against the time interval. The curves show that absolute alcohol has the lowest extraction rate and pegasol extracts at a slightly higher rate than hexane an SBP spirit. From the characteristics of the oil samples obtained b using different solvents, it is foun that the pegasol-extracted oil has a comparatively lower specific gravi saponification value, iodine va and gossypol content than th others. The alcohol-extracted o has the highest gossypol conte ne oils obtained by using pegasol, B.P. spirit and hexane were fined, bleached and the colours of e crude, refined and bleached oils re read with Lovibond Tintometer. No significant difference is observed in the refining factor of the three oils and the colours are also nearly the same. When the data are evaluated as a whole, it is seen that pegasol is a slightly better solvent than S.B.P. spirit and hexane although the solvent loss during the recovery process is higher in the case of pegasol. K.L.R.

PART III (Foreign)

NALYTICAL

Colorimetric determination sulfur dioxide from malt and er by complexing with sodium rachloromercurate (II), by etch, E. B. and Oetzel, L. I., *agric. Fd. Chem.*, 1957, **5** (12), 1.—A rapid, sensitive method is esented for the determination of fur dioxide in malt and beer ich embodies a distillation produre in conjunction with a paraaniline hydrochloride—formalhyde colorimetric determination. solution of sodium tetrachloroercurate (II) is used as the absorb- medium for sulfur dioxide. is results in the formation of the ble disulfitomercurate (II) ion ich does not require an immediate alysis for sulfur dioxide. e method is specific for sulfur xide, and no interferences have en found. When the method s applied to the determination of fur dioxide in the range of 1 to p.p.m., a maximum error of er cent was realized.

Direct determination of satued fatty acids in fats, oils, d methyl esters, by Kuemmel, F., *J. Amer. Oil Chem. Soc.*, 58, **35** (1), 41.—A direct gravitric method has been developed the determination of saturated y acids in fats, oils, and methyl rs. The procedure involves thanolysis of the triglycerides to duce methyl esters, followed by dation of the unsaturated methyl ers by potassium permanganate. e undesired, acidic oxidation ducts are removed by alkaline shing and the saturated methyl ers thus isolated are weighed ectly.

The method is intended for the ermination of saturated fatty ds having C_{16} or longer carbon chains. Small quantities of C_{14} saturated acids will be included in the determination if present with other higher saturated acids. The method is applicable to both natural and hydrogenated vegetable oils. It is not applicable to oils containing large amounts of C_{14} and lower saturated acids.

Concentrations of saturated acids ranging from 3 to 90 per cent in known glyceride mixtures and from 0.3 to 95 per cent in mixtures of methyl esters were determined with an average difference from the calculated value of 0.8 per cent. Replicate determinations on samples in the 10 to 30 per cent saturates range gave a standard deviation of 0.3 to 0.4 per cent.

BIOCHEMISTRY AND NUTRITION

Protein quality of oat varieties, by Weber, E. B., *et al., J. agric. Fd. Chem.*, 1957, **5** (12), 926.—Comparison of 16 varieties of oats was made by feeding them to groups of rats as their sole source of protein. Consistent differences were observed between the nutritive values of some of the varieties in four experiments. The levels of lysine and methionine in the protein of the oat varieties were determined but there was no correlation between the weight gains of the rats fed these oat samples and the levels of lysine and methionine in the grain. Time and location of planting of oats were not important factors in determining the nutritive value of the oat protein.

Nutritional properties of the triglycerides of saturated fatty acids of medium chain-length, by Kaunitz, H., *et al., J. Amer. Oil Chem. Soc.*, 1958, **35** (1), 10.—The influence of a purified rat diet containing 20 or 33 per cent of the saturated medium chain-length triglycerides (M.C.T.) with and without linoleic acid supplements on growth, caloric requirements for weight, maintenance and weight increase, fertility, lactation, performance, and serum cholesterol levels was compared with that of similar diets containing lard, coconut oil, or no fat.

Among the male rats maintained on diets containing 20 per cent lard or 20 per cent M.C.T. and .09 per cent linoleic acid for 18 months no differences were observed between the groups other than the depressed body weight and lowered serum cholesterol levels of the group fed M.C.T. When groups of male rats were kept at constant weight by the daily restricted feeding of diets containing lard, M.C.T., or coconut oil or no fat plus 2 per cent linoleic acid, the weight-maintenance requirements of the group fed M.C.T. were higher than of those of the requirements of the animals fed the fat-free diet. The requirements for weight increase over those for maintenance were 0.9 g. per gram increase for all diets. Additional linoleic acid in the M.C.T. diet decreased the weight and maintenance differences between groups fed M.C.T and lard.

The lactation performance of mothers in M.C.T. plus .09 per cent linoleic acid was poor. The second generation animals initially showed signs of more severe linoleic acid deficiency which however disappeared without linoleic acid supplements. Some cholesterol levels of animals of M.C.T. were significantly below those of groups on lard. Addition of linoleic acid to the M.C.T. diet did not change the results.

Nectogenic potency of yeasts grown on various media, by Gitler, C., Sunde, M. L. and Baumann, C. A., *J. Nutr.*, 1957, **63** (3), 399.—Death due to hepatic necrosis occurred rapidly and in 100 per cent incidence in vitamin E-depleted rats fed *Torulopsis utilis* grown on spent sulfite liquor as the sole source of protein. Comparable diets containing brewers' by-products yeast did not produce necrosis. Survival was increased by increasing the level of the torula-S.S.L. yeast in the diet.

Torulopsis utilis and *Saccharomyces cerevisiae* grown on a synthetic medium were both found to be necrogenic, while these same yeasts grown on commercial beer wort were both found to be non-necrogenic.

Liver necrosis was prevented by the addition of methylene blue or diphenyl-*p*-phenylenediamine (D.P.P.D.) to the diet; butylated hydroxytoluene was ineffective.

CEREALS

Changes in rough rice of different moisture content during storage at controlled temperatures, by Houston, D. F. *et al.*, *Cereal Chem.*, 1957, **34** (6), 444.—Caloro rough rice samples containing 11.2, 13.7, 15.3, and 16.5 per cent moisture were stored in loosely covered cans containing humidifying solutions for 7 months at 70°F (21°C) and 90°F. (32°C) and tested monthly for moisture, odor, viability, milling yield, free acidity, monocarbonyl compounds, total and reducing sugars, and counts of molds, yeasts, actinomycetes, and aerobic and anaerobic bacteria.

Changes in characteristics occurred more quickly and more extensively as moisture content or temperature increased, but milling yields remained unchanged until quality had seriously deteriorated. Only the two low-moisture rices at 70°F. (21°C) remained free from sourness. Oxidative changes were not detected.

Populations of actinomycetes, bacteria, and yeasts decreased under all storage conditions, though yeast reductions were small at 70°F. (21°C.) for rice of 11.2 and 13.8 per cent moisture. Molds increased in the two high-moisture rices, extensively at 16.5 per cent moisture at both temperatures. Nonreducing sugars decreased during storage, whereas reducing sugars and free acidity increases. Acid increases were logarithmic with time and the rates increased approximately exponentially with time, and the rates increased approximately exponentially with mositure content of the rice.

Percentages of germination and nonreducing sugars and log of free acidity, representing the three most sensitive characteristics, were closely related and had high co-efficients of linear correlation. Changes in these storage effects also showed trends in agreement with mold growth, a potential cause.

DAIRY

Irradiation preservation of milk and milk products, by Wertheim, J. H., *et al.*, *J. agric. Fd. Chem.*, 1957, **5** (12), 944.—A method was developed which increased the volatility of the off-flavour complex, or its precursors, of irradiated milk so that milk irradiated with 2×10^6 rep of gamma rays was obtained free from detectable off-flavours. The increase in the sensitivity of irradiated milk to browning, caused by the formation of reductones, was further studied. The production of chalky off-flavours from milk fat was caused partly by the formation of peroxides of the more saturated components, whereas oxidized off-flavours were caused by highly unsaturated fractions of the butterfat. A method was found by which milk or milk concentrates might be sterilized by cold sterilization—i.e., by the application of ionizing radiations.

FISH

Freezing in alginate jelly, by Olesen, A., *Norw. Fishing News*, 1956, **3**, 20.—The protan method of freezing fish in an alginate jelly overcomes the defects of g
and block freezing. An aque
thickened solution containing a
nate, certain salt and dilute a
so formulated that it becomes a fir
jelly at 24.8° – 23°F (–4 to –5°C
Dispersal of salt remains unifor
throughout the jelly and there is
concentration of salt on the surfa
of the frozen fish. By adjustin
the concentration of acid, the setti
time of jelly can be predicted a
the most convenient setting ti
was found to be 10—20 minute
After freezing, the jelly forms in
a hard icy composition which i
impervious to air. When thawe
it regains the softer jelly form a
–4° to –5°C and the frozen fis
can be separated from one another

H.C.S.

FRUIT AND VEGETABLE PRODUCTS

Spectrophotometric methods for determining pigmentation—Beta-carotene and lycopene—in Ruby Red Grapefruit, by Lime, B. J., *et al.*, *J. agric. Fd. Chem.*, 1957, **5** (12), 941.—Two methods for the measurement of pigments occurring in coloured grapefruit are outlined and the results compared. Method A involves extraction of the sample, separation of the major pigments—lycopene and carotene—on a magnesia-Super Cel column, elution, and spectrophotometric measurements of the separated pigments. By method B, a more rapid but less precise procedure, the pigment is extracted and the absorptivity of the extract determined at 451 mμ for carotene and 503 mμ for lycopene. Results of total concentration of the pigments, as determined by simultaneous equations, show that method B averages 10.3 per cent higher for lycopene and 16.2 per cent higher for carotene than method A. During a 69-day period, January, 26 to April 4, lycopene, in the edible fruit of Ruby Red grapefruit, decreased from 0.29 mg. per cent to 0.10 mg. per cent, and carotene from 0.34 mg. per cent to 0.21 mg. per cent.

Analytical data on some com- on fruits, by Money, R. W., *et* ., *J. Sci. Fd. Agric.*, 1958, **9** (1), 3.—The A and his co-workers blished the results of the analy- s of several fruits in 1950. In the resent investigation, the AA have nalysed certain other fruits, *viz.*, dible portions of banana, pineapple nd melon, the entire fruit of grapes, mons and sweet orange and pine- pple juice. The maximum, mini- um and average values of several nalyses for total solids, total sugars on-sugar solids, pH etc., have been iven in a table. The pH values or the majority of fruits studied in he previous publication of 1950 re also included.

K.L.R.

Through-circulation drying of vegetable materials. I.—Brewers' spent grain, by Mitchell, T. J. and Potts, C. S., *J. Sci. Fd. Agric.*, 1958, **9** (1), 20.—Brewers' spent grain has been dried by through-circulation of hot air in single layers and in beds up to 8 inches in depth.

The effect of air temperature (100-220° F) and velocity (6.63-22.2 lb. of dry air/sq. ft./min.) on the drying rates of single layers has been studied. It has been found that the drying rate is proportional to the total moisture ratio of the layer, and that both temperature and velocity have a marked effect on the proportionality constant.

A method of predicting drying times in deep beds, based on the results of the single-layer tests, is proposed and discussed. The accuracy of this method has been checked against actual drying times in deep beds and found to be within 11.5 per cent.

The resistance of deep beds to the passage of air has been investigated briefly.

Through-circulation drying of vegetable materials. II—Sugar beet, by Mitchell, T. J. and Potts, C. S., *J. Sci. Fd. Agric.*, 1958, **9** (1), 29.—The rate of drying of single layers of sugar beet cossettes has been found to vary markedly with temperature of the drying air from 140 to 220° F, and to increase slightly with a fourfold increase of air velocity, while humidity changes have little effect. The rate of drying is proportional to the total moisture content of the cossettes.

A method of predicting the rate of cossettes in beds up to 9 inches deep is given, for air velocities in the range of 6-21 lb./sq. ft./min. for temperatures of 140 to 220° F, and humidities up to 40 per cent R. H. The accuracy of the method is shown to be within ± 15 per cent.

Observations have also been made on the variation of internal temperature with change of moisture content and air temperature, and on the evidence of caramelization.

The effect of in-package dessiccation on the storage properties of compressed and uncompressed dehydrated cabbage, by Gooding, E. G. B. and Duckworth, R. B., *J. Sci. Fd. Agric.*, 1958, **9** (1), 14.—In-package dessiccation clearly provided protection not only against browning but also against deterioration in the flavour and texture of dehydrated cabbage, and has provided a real extension of storage life in both compressed and uncompressed material. The effects of in-package dessiccation on compressed and uncompressed dehydrated cabbage stored at 37° C have been compared. The rate of dessiccation from compressed cabbage was less than from uncompressed material, though deterioration was similar in both. Dessiccation reduced the rate of deterioration in flavour, texture and ascorbic acid content, as well as in colour. 50 g. of B. D. H. 8—14 mesh granulated lime (CaO) per 400 g. of cabbage shreds was used as in-package dessiccant. There was three to fourfold increase in storage life by use of a dessiccant.

H.C.S.

INSECTICIDES

DDT metabolites in faeces and bile of rats, by Jensen, J. A., *et al.*, *J. agric. Fd. Chem.*, 1957, **5** (12), 919.—A study of DDT-derived products occurring in rat faeces and bile, following the ingestion of DDT shows that the major products are, complexed forms of DDA in both bile and faeces. Uncomplexed DDA is found in the bile, and insignificant amounts of DDE are present in both bile and faeces. DDT-C^{14} was used to demonstrate that the Schechter-Haller method fails to account, quantitatively, for these metabolites. Biliary excretion is responsible for almost all of the DDT metabolites in faeces. Although bile and fecal metabolites have certain similarities, they are not necessarily identical.

Separation and identification of chlorinated organic pesticides by paper chromatography—X. Sensitivity of the chromogenic agent for the detection of pesticides in the chromatogram, by Mitchell, L. C., *J. Ass. off. agric. Chem., Wash.*, 1957, **40,** 294.—2-Phenoxy-ethanol (8 per cent v/v) or soyabean oil (1 per cent v/v) in ethyl ether was used as immobile solvent and 2:2:4—trimethylpentane, aqueous methanol, aqueous acetone, or aqueous pyridine as mobile solvent. The chromogenic agent was $AgNo_3$ in aqueous 2-phenoxyethanol and ethanol. The results of sensitivity tests in 40 pesticides are tabulated. On exposure to strong ultra-violet light the chromogenic agent detects μg. or μl. quantities of 37 of the pesticides examined.

H.C.S.

OILS AND FATS

The use of solid triglyceride stearines as fluid shortening ingredients, by Linteris, L. L. and Thompson, S. W., *J. Amer. Oil Chem. Soc.*, 1958, **35** (1), 28.—One deficiency of liquid oils as all-purpose shortenings is their failure to cause the aeration in the mixing of conventional cake batters which is a normal function of the shortening ingredient. The addition of substantially insoluble, solid triglyderides in very finely divided form to liquid oils, with the object of improving their cake performance but not destroying fluidity, has been studied. Stearines made from rapeseed and mustardseed oils and certain peanut-oil fractions possessed the desired properties. The effective triglycerides in these stearines were of the mono-behenodistearin and stearopalmitobehenin type.

The effects of alkali cooking on the yields of crude and neutral oil from cottonseed meats, by Eaves, P. H. *et al.*, *J. Amer. Oil. Chem. Soc.*, 1958, **35** (1), 33.—Six samples of cottonseed pigment glands and two samples of pure gossypol stored for more than four to nine years were re-evaluated for their acute oral toxicity in the rat and re-analyzed for gossypol content. There was no appreciable effect on the acute oral toxicity or gossypol content after these long storage periods.

PACKAGING

Quick-frozen foods packaging trends in 1957 (U.S.A.), annon. *Quick Frozen Foods*, 1957, **20** (7) 58. —Use of waxed overwraps has grown substantially but increased interest has been shown in printed packages without overwrappers as well. A new development of aluminium-foil laminated wraps are increasingly in use. Polyester, polyethylene, and cellophane type of transparent films have been developed. Fiberboard-metal end composition containers are more and more used. A trend toward full-colour vignettes of finished products has been accentuated.

H.C.S.

Heat sterilization in plastics, Wallenberg, E. and Jarnhall, B., *Modern Package*, 1957, **31**, 165 and 233.—This work was basically carried out for sterilization of surgical instruments but is of great interest in packaging of food. The investigation has been carried out to determine the prevailing pressure conditions, the inherent risk of the bursting of the package, and whether sterility can be obtained in a sealed package under normal autoclaving conditions. The tests show that (1) the packed material must be air dry, (2) there is a maximum ratio between the enclosed air and the surface area of the package which must not be exceeded if bursting is to be avoided, and (3) sterility is obtained if the material of the package is permeable to steam so that some steam can enter the package.

H.C.S.

Effect of polyethylene box liners on scald, firmness, weight loss, and decay of stored eastern apples, by Hardenburg, R. E. and Siegelman, H. W., *Amer. Soc. hort. Sci.*, 1957, **69**, 75.—Sealed polyethylene 150-gauge box liners largely eliminated weight loss, slowed ripening and reduced scald of Reme beauty, Arkansas, Gruines Golden, Jonathan and Golden Delicious apples stored at 31° F. The benefit of polyethylene liners, either sealed or non-sealed, to prevent dessiccation was greater for Golden Delicious as compared with other varieties. It is suggested that film liners used to retard ripening and reduce scald of apples in cold storage must have enough permeability so that they may be sealed with safety and allowed to create a modified atmosphere.

H.C.S.

STORAGE

Grain storage studies. XXV. Effect of invasion by storage fungi upon germination of wheat seed and upon development of sick wheat, by Papavizas, G. C. and Christensen, C. M., *Cereal Chem.*, 1957, **34** (5), 350.—Hard red spring wheats free of storage fungi and inoculated with *Aspergillus candidus*, *Aspergillus repens*, and *Aspergillus restrictus* were stored from several weeks to 7 months in dessiccators at 25° C. in the presence of humidifying solutions maintaining moisture contents from 14.7 to approximately 20 per cent. The controls that remained free of storage fungi decreased slightly or not at all germination, and little or no wheat developed in them. In inoculated with the various fungi, germination decreased derately to drastically with incre ing time of storage, and considerable amounts of sick wheat developed. In all cases, invasion the fungi preceded decrease i germination and decrease in ge mination preceded increase in si wheat. At a moisture content 14.7 to 14.9 per cent, *A. restrictu* caused more rapid reduction germination and more rapid increase in sick wheat than *A. repen* or *A. candidus*. At moisture contents of 15 to 16 per cent both *A candidus* and *A. restrictus* cause rapid decrease in germination an rapid increase in sick wheat Different isolates of *A. candidu* differed considerably in the rate o reduction in germination and rat of development of sick wheat they caused at a moisture content of 16.0 to 16.4 per cent. It seems highly probable that invasion of stored seed by these fungi is a common cause of sick wheat in commercial storage.

TEA

Studies on the 'fermentation' of Ceylon tea. IX.—A preliminary investigation of the volatile constituents of tea leaf, by Lamb, J., Ramaswamy, M. S. and Mendis, V., *J. Sci. Fd. Agric.*, 1958, **9** (1), 43.—Examination of steam distillates from tea leaves showed that the amount of $KMnO_4$-oxidizable constituents decrease during the fermentation process. Methanol was present in the distillate and its content was greatly increased by steam distillation from acid or alkaline solution. The methanol present is attributed to hydrolysis of pectin in the leaf by the acid or alkali, or by enzymes in the leaf in neutral distillations. The amount of methanol is present in the distillate in amounts far in excess of those of the substances responsible for the tea aroma.

ISOLATION AND IDENTIFICATION OF SPOILAGE ORGANISMS IN INDIAN PRESERVES

By Mirle S. Subba Rao and D. S. Johar

(Central Food Technological Research Institute, Mysore)

Introduction

Preservation of certain fruits and vegetables in high concentrations of sugar is practised in India since a long time. The finished products containing fruits or vegetables in thick sugar syrups are known as preserves or 'morabbas'. The preserve making industry is one of the important indigenous fruit preservation industry in the country and covers roughly one tenth the value of total productions. The fruits and vegetables commonly used for this purpose include apples (*Pyrus malus*), Amla (*Phyllanthus emblica*), Harhar (*Terminalia chebula*), Bihi (*Cydomia oblonga*), Bilwa (*Aegle marmelos*), Mango (*Mangifera indica*), Ginger (*Zingiber officinale*) and Carrots (*Daucus/carota*).

The quality of these preserves is often affected adversely on account of certain gaseous fermentation in them. These fermentations have been attributed to certain osmophilic strains of yeasts by early investigations[1]-[2]. No systematic study has, however, been made so far to establish the identity of these organisms. Osmophilic yeasts, as a class, have been reviewed by Henrici[3], and Mrak and Phaff[4]. Further progress in the knowledge regarding their morphology and physiology in syrups which have high osmotic pressure, has been made during the last decade. Ingram[5] traced spoilage in concentrated orange juice to osmophilic yeast. Mossel[6] and Scarr[7] likewise, associated the spoilage of products rich in sugar as well as spoilage in raw beet root to the above mentioned class of yeasts. The organisms causing fermentation in malt extract were found to belong to *Saccharomyces rouxii* species by English[9] who also studied the effect of the change of relative humidity on the growth of these organisms. The present investigations were undertaken to isolate and identify the main organisms causing fermentation in Indian preserves.

Materials and Methods

Commercial samples of different preserves were used for isolation of the organisms causing fermentation. Streaks from the samples were made on dextrose agar. After incubating these plates for 4 days at 30° C, single and morphologically distinct colonies from these plates were transferred to dextrose broth tubes. The actively growing strains from the broth tubes were further purified on plates as mentioned above and the final isolations made on malt agar slants. Details about the kind and number of each preserve examined together with the types of organisms isolated from them are given in Table I.

Table I. *Isolation of different cultures from samples of preserves*

Name of the preserve	Number of samples analysed	Number of cultures of of *S. rouxii*	Number of cultures of *S. mellis*	Number of cultures of *S. fermentati*	Total number of cultures
Apple	16	17	3	1	21
Ginger	2	4	...	...	4
Amla	3	...	2	1	3
Bilwa	3	2	...	1	3
Carrot	2	1	1	1	3
Bihi	1	2	...	...	2
Harar	1	...	...	1	1
Mango	1	...	...	1	1
	29	26	6	6	38

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The identification of these organisms was carried out by usual techniques given in literature. For sporulation studies 18 hour old cultures of actively growing organisms from dextrose broth were transplanted on Gorodkowa's agar, malt agar and carrot plugs. Anaerobic growth of these organisms was studied using both the slide cultures and plate methods. Fermentation tests were carried out according to the methods of Lodder and Kreger-van Rig,[9] Wickerham[10]. Carbon and nitrogen assimilation tests were conducted using auxanographic methods. Instead of the normal practice of testing with 4—5 sugars at a time only two sugars were tested on each plate to avoid confusion on account of the complementary effect on growth in otherwise too close adjacent sectors. Ethanol assimilation was determined using a liquid medium.

Nitrate assimilation test was carried out in the same way as carbon assimilation test. The basal medium was free from nitrogen source.

Growth in concentrated sugar syrup was determined by growing cultures in a syrup of 68° brix containing sufficient yeast extract and ammonium sulphate.

Results obtained are presented in Table II.

Results and Discussion

Fermented commercial samples and unfermented samples collected at the factory from bulk samples were the source from which these isolations have been made. The samples are from a wide range of fruits and vegetables from different parts of the country. The processing methods are not the same all over the country. With all these variable factors, the spoilage organisms are restricted to only three groups of osmophillic yeasts. It may be said that the predominating spoilage organisms in murrabba belong to these three groups.

The entire collection of cultures can be grouped into three species, viz., (A) *S. rouxii* (26 strains); (B) *S. mellis* (6 strains); and (C) *S. fermentati* (6 strains). None of the cultures produced either ring or pellicle when grown in dextrose broth. Sediment was, however, noticed in all the cultures. Pseudomycilum was not produced by any of the cultures.

Groups A and B produced 1-4 spores, wh Group C produced 1-2 spores only. All spe were spherical.

The pattern of fermentation of sugars di uishes one group from the other. Cultures 'A' group fermented glucose and maltose and d not ferment galactose, sucrose, lactose, raf Glucose and maltose were assimilated by the cultures while a few cultures in the group we able to assimilate the galactose. But none of t cultures could assimilate sucrose and lacto Ethanol cannot be used by any of these culture Nitrate nitrogen cannot be used by these cultur All these cultures gave a good growth in concer trated sugar medium.

The biochemical characters of cultures groupe together in 'A' type agree with the descriptio for *Saccharomyces rouxii* as given by Lodder an Kreger-van Rig[9]. These organisms can be sai to belong to that group.

The cultures grouped under 'B' type fermente only glucose and did not ferment galactose maltose, sucrose, lactose and raffinose. It wa noticed that only glucose is assimilable by thes cultures. Ethanol did not promote any growt and nitrate nitrogen could not be used by these cultures as a source of nitrogen. Good growth was noticeable in concentrated sugar medium.

These descriptions agree favourably with th description for *Saccharomyces mellis* of Lodder and Kreger-van Rig[9]. Hence these organisms can be said to be similar to *S. mellis*.

The fermentation of sugars of the 'C' group is different from the above two groups. The cultures in this group fermented glucose, maltose and sucrose while it did not ferment galactose and raffinose. Glucose, maltose and sucrose were assimilated by these cultures, while galactose and maltose were not assimilated. No growth was seen with ethanol as carbon source. Nitrate could not be used as nitrogen source. Good growth in concentrated sugar medium occurred with all these cultures.

The biochemical characteristics were in fair agreement with the standard description for *Saccharomyces fermentati*. That type culture can ferment raffinose $\frac{1}{3}$ while this culture does not ferment raffinose. This is the only difference.

TABLE II. *Morphological, cultural and biological characteristics of the cultures*

p	Vegetative cells	Growth on Malt agar	Growth in glucose broth	Slide culture	Asc-ospore formation	Fermentation of sugar						Carbon assimilation					Ethanol as source of carbon	Growth with Nitrate as sole source of Nitrogen	Growth in conc. sugar solution
						Glucose	Galactose	Maltose	Sucrose	Lactose	Raffinose	Glucose	Galactose	Maltose	Sucrose	Lactose			
" ul- s	From malt agar, cells are large, round or oval; single or pairs; sometimes in chains. Av. (3.4-6.9) × (3.4-10)μ *S. rouxii.*	White to light cream dull, irregular frequently covered with wrinkles. Growth is slow	Sediment; no ring; no film.	No pseudomycelium.	1-4 spores per ascus Spherical.	+	−	+	−	−	−	+	±	+	−	−	No growth	Absent	Good
" il- es	From malt agar, cells are round or oval. Single, pairs or in small chains. Av. (2.3-4.6) × (4–8)μ *S. mellis.*	White to dull cream; dull, irregular, convered with wrinkles.	Sediment; no ring; no film.	No pseudomycelium.	1-4 spores per ascus. Spherical.	+	+	+	−	−	−	+	−	−	−	−	No growth	Absent	Good
" il- es	From malt agar, cells are round to oval. Single or in pairs. Av. (2-5) × (3–7)μ *S. fermentati.*	White to dull cream; smooth margin; lobated.	Sediment; no ring; no film.	No pseudomycelium.	1-2 spores per ascus Spherical.	+	+	+	−	−	−	+	+	−	+	−	No growth	Absent	Good

Note: + denotes positive; — denotes negative; ± denotes positive in few and negative in others.

These cultures had been tentatively grouped under *Saccharomyces fermentati.*

Summary

1. Isolation of spoilage organism from 21 commercial samples and 8 factory samples were done. The samples of 'murrabba' analysed consisted of apple, Amla, carrot, ginger, Bilwa, Bihi, mango and Harar.

2. In all, 38 cultures were isolated, and the identification of these cultures revealed that the cultures belong to only 3 types namely, *S. rouxii*, *S. mellis*, and *S. fermentati.*

Acknowledgment

The authors are grateful to Dr V. Subrahmanyan, Director for his keen interest during the course of the investigation.

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CANNING OF ORANGE SLICES (RINGS)

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Orange segments are generally canned as such after removing their outer covering either by knife-peeling or by means of hot lye solution. In connection with the work on the canning of mangoes[1] and other fruits without removing the peel, it was of interest to study the possibility of canning oranges either in the form of unpeeled segments or as slices. Further, this work was of additional interest in view of the recent findings that the albedo portion of the orange contains valuable vitamin-like principles. The results are discussed briefly in this paper.

Material and Methods

Coorg and Sathgudi oranges of medium size and good quality were used in these experiments. In the case of Coorg oranges, they were sliced transversely into 4 pieces, about ½″ thick, by means of a power-driven pineapple slicing machine. The seeds were removed from the rings by means of a fork and the peel was subsequently lifted easily. This method of slicing and subsequent removal of the peel was found to result in better rings than the alternative method of first peeling the whole orange and then slicing it. In the latter case, the slices were bruised and damaged to some extent. The retention of the peel thus prevents undue breaking up of the slices. In the case of the *Sathgudi* orange, however, it was found better to peel the fruit first and then slice it on the machine. Any peel oil that collected on the slide plate of the machine was wiped with a sponge at frequent intervals and recovered. The slices were canned in plain jam size cans (301 × 309) using 7 oz. of fruit (6-7 slices) and 6 oz. of syrup of 40° Brix per can. The cans were given an exhaust of 25 minutes at 180-185° F, sealed and processed for 25 minutes in water at the same temperature. They were then cooled in running cold water and stored at room temperature of 24-30° C to study their storage behaviour.

After storage for nearly 2 years, the cans were opened for cut-out tests and examined physico-chemically as well as organoleptically. Ascorbic acid in the syrup was determined by the xylene extraction method of Robinson and Stotz[2]. Its acidity and pH were also noted by titration w standard 0.1 NaOH and by means of a gl electrode pH meter (Cambridge).

Results and Discussion

Data regarding the physical composition of t orange and the comparative percentages of yi of segments before and after lye peeling and the form of rings suitable for canning are giv in Table I. It will be noticed that the yield segments in the form of slices suitable for cannin is nearly 53 and 63 per cent of the weight of th orange in the case of Coorg and Sathgudi oranges the corresponding figures in the case of the ly peeled segments being 44 and 65 per cent respectively. Further, in the case of slicing, there is a further recovery of 12-13 per cent of segment in the form of bits from the top and bottom slice of the oranges and these could be utilized for canning in the form of bits or for the preparation o products like juice, squash, marmalade, etc. There is thus a higher percentage recovery of the segments in the form of slices and bits than in the case of lye-treatment and thereby a better utilization of the edible portion of the orange. Further, the sliced orange corresponds most closely to the form in which an orange is consumed by most people, although the lye peeled segment would be preferred by some people as

Table I. *Physical composition of Coorg and Sathgudi oranges*

Particulars	Coorg Orange	Sathgu Orang
1. Average weight of fruit (oz) ...	4.9	6.1
2. Yield of rings suitable for canning (as % of fruit)	52.6	63.0
3. Yield of bits from top and bottom slices (as % of fruit)	13.3	12.3
4. Peel (as % of fruit) ...	33.3	23.3
5. Loss in handling (due to loss of Juice, peel oil, etc.) (as % of fruit)	0.9	1.4
6. Recovery of lye-peeled segments as % of fruit	43.87	65.1
7. Loss during lye-peeling as % of segments.	33.3	13.5

eing free from any adhering segment covering nd veins and therefore in a more elegant form or consumption.

Cut-out data of canned Coorg and Sathgudi range slices at the end of 2¼ years of storage at oom temperature of 24-30° C are given in Table I. It will be noticed that in the case of Coorg orange, the Brix of the syrup is slightly higher and acidity considerably less than in the case of the Sathgudi Orange. The canned Coorg orange slice is, therefore, slightly on the sweeter side; otherwise, it is very good generally. Contrary to expectation, the Coorg orange slice as well as the syrup are remarkably free from any trace of bitterness, while the Sathgudi orange slice has a slightly bitter after-taste, most probably due to the presence of a considerable amount of the albedo portion which is not completely removed while peeling, unlike in the case of the loose-jacket Coorg orange. Both the oranges have a pH range (3.2-4.0) which facilitates the safe processing of the cans under normal conditions. In the case of both the oranges, the covering syrup in the can contains a much higher concentration of true ascorbic acid than the drained fruit. The concentrations of ascorbic acid in both cases are, however, low and the retention of the original ascorbic acid in the can is about 18 per cent only on account of the prolonged storage of the canned product.

TABLE II. *Cut-out examination of canned orange slices at the end of 2¼ years' storage at 24-30° c*

Particulars	Coorg orange	Sathgudi orange
1. Vacuum/Head space	5″/¼″	5″/¼″
2. Net weight of contents (g) ...	362.0	358.5
3. Drained weight of fruit (%) ...	67.5	73.8
4. Strength of cut-out syrup, (deg, Brix at 20°C) ...	27.35	24.34
5. Acidity of syrup (as anhydrous citric acid) present ...	0.32	0.69
6. pH of syrup ...	4.04	3.13
7. Fruit:		
Colour ...	Orange yellow	Light yellow
Texture ...	Whole slices, not broken	Whole slices; not broken. Juice sacs slightly 'dry'
Taste and flavour	Sweet. Not bitter, characteristic taste and flavour	Very faint bitter after taste; otherwise very good taste and flavour
8. Syrup:		
Colour	Yellow	Yellow
Consistency	Clear	Clear
Taste and flavour	Not bitter	Not bitter
9. Condition of can inside ...	Moderate feathering	Moderate feathering
True ascorbic acid in fruit mg/100 g. ...	1.04	4.82
True ascorbic acid in syrup mg/100 g. ...	3.83	6.15
True ascorbic acid in contents of can mg/100 g.	1.99	5.12
Retention per cent of ascorbic acid	18.0	18.3*
10. Remarks ...	A very good canned product, superior to canned segments	Good canned product

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* Original average concentration of ascorbic acid in the fruit 20 and 50 mg. per 100 g. in the case of Coorg and Sathgudi orange slices.

Conclusion

A method has been standardised for canning Coorg and Sathgudi oranges in the form of slices or rings. The recovery of the segments in the form of slices is considerably higher than in the case of lye peeled segments. The canned Coorg orange slices are remarkably free from any bitterness, while the Sathgudi slices have a very faint bitter after-taste. Both products have, however, excellent characteristic orange flavour even after prolonged storage.

Acknowledgment

The authors wish to express their gratitude to Dr V. Subrahmanyan, Director and Dr Girdhari Lal, Assistant Director of the Institute, for their keen interest in this work.

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CANNING OF MUSK MELON WITH OTHER FRUITS

By G. S. Siddappa and B. S. Bhatia

(Central Food Technological Research Institute, Mysore)

The possibility of canning tropical fruits like some varieties of mangoes, jack fruit, etc., having a high pH, in combination with other fruits having a comparatively low pH has been studied in these laboratories[1,2].

In this connection, the canning of musk melon fruit (*Cucumis Melo* L.), which is available in large quantities during the months of April and May, is deemed to be of considerable interest. Since this fruit has a pH of 5.0—5.2, which is much higher than 4.5, attempts were made to can it in acidified syrup as well as with other fruits having a lower pH. The results are presented in this paper. Canning of musk melon in salad form is also recently gaining importance in Australia.

Experimental

Firm ripe melons (*Cucumis Melo* L.), having white to slightly pinkish pulp, obtained from the local market, were used for canning. The other fruits used were papaya, banana, grape, mango and pineapple. All the fruits were prepared as for canning. Syrups of 40 degree Brix with and without added citric acid and plain 1-lb. jam size cans were used. The different combinations of fruits were made by weighing each fruit separately into each can. Cans filled with fruit and syrup (227 g.+128 g.) were exhausted to a central can temperature of 170° F, sealed, processed for 30 minutes in boiling water and cooled. The canned products were stored at room temperature of 24-30° C and examined at the end of 7 months' storage. Data regarding vacuum, drained weight, Brix and pH of syrup, etc., were collected. They are presented in Table I.

Results and Discussion

It will be noticed from Table I that it has been possible to reduce the pH of the contents of the can to well below 4.0 by combining melon other more acidic fruits like mango, pinea and grape. In the case of combination with ot less acidic fruits like banana or papaya, it is sary to add acid to the canning syrup to lower pH to a safe level for normal processing of can in boiling water. Melon and pinea tidbits blend so well that pieces of these two fr look almost alike. Melon itself canned in syr of 40° Brix containing 0.5 per cent added cit acid is an excellent product having good textu appearance and characteristic pleasant taste flavour. An increase in the proportion of mel in the combination of fruits leads generally to slight decrease in the percentage of drained weig of fruit in the can as well as in the Brix of syrup. This is due to the watery nature of melon.

Summary

Although melon requires the addition of aci to the syrup for safe processing of the can i boiling water, it is possible to can it in combination with other more acidic fruits like mang pineapple and grape in plain syrup only, sinc the combination has a pH well below 4.5. Canne melon itself is a very palatable product.

Acknowledgment

The authors feel highly grateful to Dr V Subrahmanyan, Director of the Institute and D Girdhari Lal, Assistant Director for their kee interest in this investigation.

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TABLE I. *Data for Musk Melon canned with other fruits at the end of 7 Months' storage at 24-30 C*

Combination	Syrup used	Vacuum in can (inches)	Drained weight of fruit (per cent)	Cutout syrup		Condition of			Remarks
				Brix Deg.	pH	Fruit	Syrup	Can	
Melon only	+0.5% acid	9.5	47.1	19.0	3.62	Greenish white pieces	Clear except for slight pulp	Normal	Good product with full melon flavour
Melon + Raspuri mango 4 : 6	plain	12.5	52.4	22.5	3.45	Good texture	Clear, pale yellow	,,	Mango flavour predominant
6 : 4	,,	10.5	49.5	19.0	4.12	,,	,,	,,	Melon flavour noticeable
Melon + Pineapple 4 : 6	,,	10.0	54.8	21.5	3.30	,,	Clear, light yellow	Very slight feathering	Melon flavour
6 : 4	,,	10.5	51.3	21.0	3.66	,,	,,		Good blend of both fruits in colour. Mellow melon flavour
Melon + Grape 4 : 6	,,	11.0	47.5	21.0	3.13	Melon pieces slightly soft	Clear, yellow	Slight feathering	Grape flavour
6 : 4	,,	11.0	44.7	20.0	3.32	,,	,,	,,	Melon flavour
Melon + Raspuri + Pineapple 4 : 2 : 4	,,	11.5	54.3	22.0	3.32	Good texture	Clear, pale yellow	,,	Mild melon flavour
Melon + Papaya + Pineapple 4 : 2 : 4	,,	8	59.3	22.0	3.82	,,	,,	,,	Melon flavour
Melon + Banana + Pineapple 4 : 2 : 4	,,	14	53.1	24.0	3.99	,,	Clear, light yellow	,,	Good blend of fruits-Banana flavour noticeable
Melon + Papaya + Grape 4 : 2 : 4	,,	11	50.1	21.0	3.34	Grapes slightly split	Clear, yellow	,,	Grape flavour
Melon + Banana 4 : 6	+0.5% acid	14	53.1	25.0	3.74	Soft pieces	Clear, light yellow	,,	Banana flavour

BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during April, 1958 are given in this section.

S (IS) 10

Some aspects of the problem of old vs. New Rice, by H. S. R. Desikachar (7th April 1958): The speaker at the outset discussed the advantages of 'Wet Heat Treatment' as a curing method for freshly harvested rice. The results of the laboratory, pilot plant and commercial trials on the curing of fresh paddy using the above steaming treatment were described. The keen interest evinced by rice millers in adopting this method was referred to by the speaker and the present position with regard to production, sale and consumers' acceptability of the cured rice along with the advantages and economics of the process was discussed. The need for popularising this method of curing in the other rice growing States where raw rice is consumed in large quantities was stressed. The speaker pointed out the difficulties that may be encountered in the drying of the steamed paddy without allowing it to develop cracks. Further possible lines of improvement and perfection of the method with a view to making it continuous and applicable even to the soft varieties of rice were indicated.

The addition of mercuric salts to the cooking water to inactivate the amylases did not improve the cooking quality of the rice. At the same time, cooking of the rice in a solution of amylases did not induce pastiness. For these reasons, it was felt that the amylases play a minor role as a determining factor in the cooking quality of the rice. The effects of certain physical treatments to alter the native condition of the starch and protein in new rice and the beneficial effect of formalin treatment on the cooking quality of new rice was referred to by the speaker. In this connection, the results of studies on the settling characteristics of emulsions of new and old rice flour were presented.

A new method of judging the swelling quality of rice by a measure of the increase in length and breadth of the grains during cooking was described. Using this method, it was found that old rice had greater capacity to increase in length (along the long axis) than new rice which after about 10 minutes of cooking had a tendency to burst along the ventral line of fusion causing dispersion of granules into the cooking water and thus inducing pastiness to the cooked rice. A greater expansion of the Terminal Segments along this axis and of the Ventral segment along the short axis was observed in the case of both old and new rice. Studies on the structure of sections of cooked new and old rice showed that with progressive cooking, the integrity of cell-wall structure was destroyed, but new rice exhibited this tendency at an earlier stage of cooking than old rice. Parboiled rice was found to have a very hard structure. The hardening of the cell-wall etc., during storage was indicated by this study.

The speaker drew an analogy between the changes occurring during storage in rice and those observed during staling of bread. The need for observing further similarities or differences between the changes during these two processes and for retarding the storage changes in rice so as to obtain material in native condition for research purposes was referred to by the speaker.

The talk was then followed by an interesting discussion, where several points, e.g., the suitability of different varieties for curing, the effect of curing on the biological value of the protein of rice, the study changes in cell-wall etc., were rais

The President reviewing discussion pointed out the eco mic value of the project and t that this was taken up for the be of the common man and if all millers could adopt this proc then we will be getting old r throughout the year at a cheap ra He suggested that there should a search for other compoun permissible by food laws, whi may have the same action as that formalin. He further pointed the role of humidity in drying t fresh rice to avoid cracking. concluded by saying that the resul of these studies should be extende to as many rice mills as possible.

S (IS) 11

Effect of heat on the nutritiv value of edible oils, by N. Raju (19th April 1958)—In Ind as also in other countries, a lar percentage of the total fat intake i through dietary articles which a subjected to frying. The conditio of frying, such as temperature an time, vary widely, while heatin the oil in open iron pan increase the oxidative changes to a greate extent, than those associated wit polymerised oils. In addition, the residual oil from a day's operation i reused on a subsequent day. Such a practice may accelerate th oxidative and other changes, particularly in hotels, where the conditions of heating are much more drastic. As no scientific information was available on the subject, it was felt desirable to investigate the problem.

Oils heated in open iron pans at 250-260° C for eight hours were incorporated at 15 per cent levels into synthetic diets containing 12 per cent protein (casein) with the sual supplements of vitamins. uch diets were fed to groups of ats, the control rats in each case eceived the respective unheated il. The growth of the rats conuming the heated oils was reduced y 50 per cent and the fat content f the liver of these rats was inreased by 100 per cent.

A high protein diet (40 per cent r 25 per cent casein) was found to vercome the adverse effects f the heated oils. Liver extract lso afforded certain amount of rotection. The sulphur amino cids, methionine and cystine, when ed at levels to correspond to 40 er cent casein, also reversed the ffects of heated oils.

The absorption, utilization and torage of vitamin A and carotene vere considerably reduced in the ase of the animals receiving the eated oils. It was also found that many of the vitamins of the B-complex except riboflavin and icotinic acid were destroyed to arying extents when kept mixed with diets containing heated oils, itamin A was lost completely in a few hours. The chemical changes accompanying the heating of the oil showed that apart from iodine value, the other factors did not prove to be significant. The digestibility of the heated oil was lowered.

The talk was then followed by an interesting discussion. In answering the points raised, it was pointed out that the temperature of 250-260° C was arrived at by actually taking the temperature of oils in a hostel and in some houses. During certain feeding experiments, the white albino rats nearly turned yellow which denoted indirect evidence of pathologic condition of liver, though the histopathological studies of the livers of experimental rats were not made. All the experimental rats fed in preliminary trials at 30 per cent of the heated oil died in one week and intestinal haemorrhage was observed when these rats were dissected. The adverse effects produced in eight weeks on feeding 15 per cent heated oil were also produced with 5 per cent heated oil over a period of 12 to 18 months. The rats lost completely their hair coat and indicated a highly sickly condition. It was pointed that such studies should be conducted with food fried in the oil instead of the oil itself and the exact conditions of frying in home should be adopted. It was further suggested that histopathological studies of the liver of these rats, the excretion of sulphur amino acids in the faeces and the microbiological examination of the faeces should also be investigated. The other points raised were inclusion of vanaspati in such experiments and the effect of ketogenic system *vis-à-vis* blood sugar level.

The President, in his concluding remarks pointed out that in his opinion the fried food is not so toxic as the data relates and for this purpose the programme of work may be re-oriented and made extensive. Human metabolism studies should be made with the fried food instead of fried oil only. The effects on different types of oils should also be studied.

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Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Cold storage of mango

E (S) 33

Kindly let me know data on the optimum conditions of cold storage of different varieties of mangoes. (Dumraon, Bihar).

Mangoes for cold storage should be picked when they are fully grown but green in colour. The optimum cold storage conditions and the relevant storage lives for the various varieties are given below:

Variety		Storage Tamp., °F	Relative humidity	Approximate cold storage life, (weeks)
1. *Badami* (Alphonso)	...	47–50	85-90	4
2. *Badshah Pasmed*	...	42–45	,,	5
3. *Dasahari*	...	,,	,,	4
4. *Dilpasand*	..	,,	,,	5
5. *Khuddns*	...	,,	,,	5
6. *Lala-i-Babaha*	...	,,	,,	5
7. *Neelam*		,,	,,	4
8. *Pa ire*	..	,,	,,	4
9. *Raspuri* (Peter)	...	,,	,,	6
10. *Safeda*	...	,,	,,	7
11. *Totapuri* (Bangalora)	...	,,	,,	8
12. *Seedlirg*	...	,,	,,	6

During cold storage, the mangoes remain in a more or less green condition, except for a slight yellowing in the case of Badami mangoes at 47-50° F. After cold storage the mangoes can be ripened either at room temperature or at a controlled temperature of 67-70° F. At 67-70° F, the mangoes may take 10-15 days for ripening.

Beet Roots

E (F) 34

Kindly advise me on the best method of packing beet boot in tins. (Bombay).

Beet roots contain anthocyanins which turn brown in the product obtained from beet roots when heated for long periods. The tin and iron of the plain type cans combine with the anthocyanins, and form violet coloured salt thus making the pack rather unattractive. The remedy to minimise this type of adverse colour change is firstly, through exhausting of the cans before sealing (This is very important); and secondly, the use of acid resistant lacquered cans. (Plain tins should not be used.)

Discolouration in tomato products

E (F) 35

Kindly elucidate what are the causes for discolouration in tomato products during storage together with remedy. (Bombay).

In general, discolouration of tomato products is mainly due to the improper selection of the tomatoes used in the above products. It is very essential in the case of these products, that only deep red coloured tomatoes properly matured are used. Green tomatoes or green portions of partially ripe tomatoes if incorporated in any of the tomato products would turn the product brown because chlorophyll present in green p tions becomes brown when hea in the presence of acid in tomat Therefore, utmost care should exercised in avoiding any gr portions or green tomatoes in preparation of good quality tom products. Green portions of tom toes used, if any, should be prop trimmed.

It may further be mentioned t temperature of storage and oxyg content are the most significa factors for deterioration of colo during storage. It will thus seen that even a product prepar from the right type of raw mater undergoes gradual browning duri storage which can be minimised lower temperature of storage and al by reducing the presence of oxyge in the product. The amount oxygen can be minimised thorough exhausting of the cann products and by filling scaldi hot the product which have to filled in bottles, leaving the lea amount of head space in the con tainers. Besides the above facto which contribute to browning tomato products, contaminati with copper or iron also bring about the rapid browning of th product during storage. Prolonge cooking of the products on 'bhatti or coal hearths is also responsib for rapid browning of the produc during storage or even during th process of cooking in such cases.

Blackneck in tomato ketchup

E (F) 36

What is blackneck in tomat ketchup and how it can be prevented? (Bombay).

'Blackneck' formation in tomat ketchup is a phenomena occurring during storage. Our experiments have indicated that after filling the bottle with scalding hot tomato ketchup, if ascorbic acid at the rate of 100 p.p.m. of the product is added in the form of water solution, it will considerably help in delaying the formation of this black neck.

Bottle closures

E (F) 37

Could you please let us know if, instead of using the bark wood corks to seal bottles, there is any objection to the use of only bakelite screw-on caps with cork-discs overlaid with the usual white polythene film, dispensing with the use of the former (corks) entirely? (Calcutta).

Bakelite screw-on caps of the given description can be used successfully to replace the ordinary bark-wood corks provided you can get bottles with uniform mouth dimensions. Ordinary quality of bottles will not have uniform mouth and as such they are likely to leak with these screw-on caps. Further care has to be taken that the cork discs overlaid with the white polythene film, are thick enough to avoid contact of the material of the bottle with the bakelite material of the cap, because contact of bakelite with acid products is not desirable as it is likely to impart phenolic taste and odour to the product.

Lime juice cordial

E (F) 38

Whether, for the purpose of clarifying lime juice cordial, and in order to precipitate sediment more speedily, there is any objection to the use of egg-whites? (Calcutta).

For clarification of lime juice for cordial making, albumen can be used because this clarifying agent is commonly used for the clarification of wines, etc. However, in our laboratories, we have found that for the clarification of lime juice for cordial making, a combination of tannin and gelatin solutions of specific strengths gives very satisfactory results. If you are interested in this process, you may please let us know and we shall let you know the data available on this with us, for your trials.

Machinery requirement for manufacturing corn flakes

E (IS) 39

We shall feel obliged if you could guide us regarding the machinery required for manufacturing corn flakes. (Bombay).

The nature of equipment required depends upon the capacity of the plant envisaged. The list of important machinery required are as follows:

(1) Rotary steam cookers.
(2) Agitator or Lump breaker.
(3) Pan coolers with machanical stirrers meant for cooling the cooked corn grits.
(4) Gravity-type drier; through which preheated air is blown to reduce the moisture content of the cooked grits to about 15 per cent.
(5) Tempering tanks meant to facilitate uniform distribution of moisture, and
(6) Flaking machine consisting of steam-heated stainless steel rollers.

All the parts of the machinery should be preferably made out of stainless steel so that the product will have very good appearance. If you need fuller details with photographs of the machinery used, you may kindly refer to the book entitled, *The Chemistry and Technology of Food and Food Products*, Vol. III by Morris B. Jacobs; published by Interscience Publishers Inc., 250, 5th Avenue, New York.

Ice cream mix powder

E (IS) 40

Please suggest me some useful books on ice cream mix powders. (Poona).

You may refer to the following books on the subject:

(1) Ice cream and other frozen desserts, by J. H. Frandsen, Amherst, Massachusetts, U.S.A.
(2) The Ice Cream Industry, by G. D. Turnbow, P. H. Tracy and L. A. Raffetto, 2nd Ed., published by John Wiley and Sons, Inc., N.Y.
(3) Manufacture of Syrups and Cold Drinks, 8th Ed., published by Industry Publishers, Ltd., 22, R. G. Kar Road, Shambazar, Calcutta.

Edible gelatin

E (IS) 41

Will you kindly give me the names of suppliers of edible gelatin in India (Poona).

The following firms may please be contacted:

(1) M/s Gordhandas Desai and Co., 305, Hornby Road, Bombay.
(2) M/s Babulal and Co., Princess Street, Bombay-2.
(3) India Scientific Traders, 460, Sardar Vallabhai Patel Road, Bombay-4.

Ice cream composition

E (IS) 42

Could you kindly advise me regarding the various types of ice-cream compositions? (Baroda).

Ice cream is a forzen product made from a mixture of dairy products, sugar, stabilizer, flavouring and colouring agents, with or without eggs, fruit juice nuts, etc. Innumerable number of formulas can be evolved depending upon the wide variety of ingredients used. The dairy products that are used are cream butter milk, milk powder and condensed milk. Sucrose either alone or better along within-vert sugar or glucose gives the sweetening effect and enhances the creamy flavour. The stabilizers generally employed in the industry are cellulose gum, gum tragacanth, India gum, agar-agar, gelatin and pectin. The addition of these in small quantities prevents the formation of large ice crystals. The materials are mixed together in proper proportions so that a typical ice cream mix will have the following composition.

Butter fat	8–10%
Milk solids not fat ...	11–12%
Sugar	13%
Gelatin	0.5%
Total solids	32–35%

The mix is pasteurized to eliminate bacteria by heating it with steam or hot water to about 145° F and holding at that temperature for 30 minutes. The mix is then passed through a homogenizer and rapidly cooled to 45° or 40° F. The cooled mix is passed into ageing vats where it is maintained at that temperature for about 16-24 hours. This ageing improves the flavour and increases the viscosity of the mix. The mix is finally passed into the freezers, where flavouring essences, colouring matter, fruits, etc., are added. When the mix gets frozen, the ice cream is run into containers which are placed in the hardening rooms maintained at 5 or 0°F and left for 2 or 3 days.

The formula for a standard ice cream is given below:

Ingredients for 100 lb. mix

Cream (40% fat) ...	24.61 lb
Milk (4% fat) ...	53.79 ,,
Skim milk powder ...	5.18 ,,
Sugar	12.22 ,,
Gelatin	0.30 ,,
Corn syrup solids ...	4.00 ,,

Mango cereal products

E (IS) 43

I will be grateful if you could kindly give me details of the manufacture of mango cereal flakes.

Large quantities of mango pulp obtained as a by-product of mango canning industry are available in India. Besides, there is a large surplus of the fruit during the glut season which does not find any profitable use at present. The Central Food Technological Research Institute, Mysore, has developed some mango cereal products which offer wide scope for utilizing the surplus fruit. The products, available as flakes, vermicelli, and flour, have met with good consumer appeal.

Flakes: The flakes are composed of 49 per cent mango solids, 23 per cent wheat flour and 28 per cent added sugars, and contain about 9 mg. per 100 g. of carotene. One pound of cooked wheat flour (obtained by cooking whole wheat in an equal quantity of water for 30 min. at 10 lb. per sq. in. steam pressure in a pressure cooker, drying the cooked grains, milling and sieving through 80-mesh sieve), is added to 8 oz. each of cane sugar and dextrose. Mango pulp (15 lb.; solid contents, 18 per cent) screened through 30-mesh sieve, is mixed and the mixture dried in a drum drier, preferably under vacuum. It is pressed through rollers (50 lb. sq. in. pressure), the clearance between the rollers being 0.01 inch. The flakes thus obtained contain about 2 per cent moisture and can be stored satisfactorily in friction top tins. The acidity of pulp (prior to the addition of other ingredients) is adjusted to a pH of about 5.0 by adding sodium bicarbonate. During processing mango pulp loses about 30 per cent of its carotene; during storage of the finished product the carotene remains fairly stable. The flakes which possess a pleasant mango flavour, can be used with milk as a breakfast food like corn flakes; being sweet, and crisp, they can be consumed as such. They can be used in ice cream as a thickener and flavouring material. One ounce of the product supplies about 4,000 I.U. of vitamin A besides other fruit nutrients.

Vermicelli: In the preparation of vermicelli. the neutralized pulp (screened through 30-mesh is concentrated to about half volume and a dough prepared white wheat flour (80-mesh; 1 flour per lb. of pulp). The lat is extruded through a vermice press and the strands are dried in air blast drier at a temperature about 60° C., followed by lig roasting as in the case of ordin wheat flour vermicelli. The l of carotene during processing is the order of about 40 per cen during storage of the product th carotene remains fairly stable. Th product contains about 4 mg. carotene per 100 g., (1 oz. will su ply about 2,000 I.U. of vitamin A The vermicelli containing abo 30 per cent mango solids, 70 per ce wheat flour and 5-6 per cent moi ture content can be stored sat factorily in friction top tins. Var ous types of dishes normally pre pared from the common vermicel can be prepared from this produc and they are all highly palatab and fruity in flavour.

Mango cereal flour. The produc contains 50 per cent mango solid and 50 per cent wheat flour, and i prepared by drying a mixtue of parts of mango pulp (passed throug 50-mesh sieve; acidity<0.5 per cent and one part of fine wheat flou (80 mesh). A mechanical mixer ma be employed to ensure thorough mixing of the pulp and flour. Drying is done in an air blast drier, maintaining a temperature of 70-80°C, for about 2 hours and 55-60°C subsequently. The dried product which is in the form of lumps is milled to yield the flour. About 30 per cent carotene is lost during processing; the final product contains about 7.5 mg. of carotene per 100 g. It has a moisture content of 2 to 3 per cent and keeps well if properly packed and stored in friction top tins. It may be used for *parothas*, *chapatis*, *halwa* and other preparations for which cereal flour is normally used.

Notes and News

NEWS BRIEFS

Canned cod livers: Only fresh cod livers must be used. On arrival at the cannery all livers should be held in metal containers, packed in finely crushed ice, until used. All livers must be thoroughly washed in clean running, cool water, and those not fresh or not white in colour must be discarded. The washed livers are brined in cool saturated pickle, containing a small amount of saltpetre, for thirty-five minutes.

Formula for this pickle consists of 9 gallons of water, 26 lb. table or dairy salt, and 10 oz. saltpetre. The pickle should be kept up to strength and changed frequently.

After brining, the livers are spread on trays and allowed to drain. They are then brought to the packing table, where they are placed in small tins such as are used for canning fish or lobster paste (3 oz. or smaller). The cans should be well filled, allowing not more than 1/8 inch, head-space. After exhausting the cans for approximately eight minutes in a steam or exhaust box, they are sealed and processed at 240° F. for thirty minutes (3 oz. cans). The cans are cooled in cold water immediately after removal from the retort. (*Food Manuf.*, November 1957, p. 537).

Glace cherries: The following is a recipe for glace cherries, which is given as a basis for experiment:

The cherries are first exposed to sulphur fumes for about five hours in a sulphur cabinet. They are then put into wooden buckets and covered with water in which 1 oz. of sulphite of soda to each twenty quarts of water has been dissolved.

The cherries are pitted and blanched and kept in cold running water for about an hour, and then allowed to dry out on hurdles. The canning is done by placing the cherries in earthenware jars and pouring a syrup of 22° Beaume over them (when boiling), leaving one hour, then draining the syrup and boiling to 24° and again pouring over the cherries. Leave for twenty-four hours, drain the syrup and sugar, and boil to 25°, pouring over the cherries. Repeat the operation three times more every second day. The strength of the syrup is then increased to 27°. Three days later drain and increase to 28°. Three days later increase to 30°, adding to the syrup a small quantity of carmine to colour the cherries red. Resume the draining four days later, boiling the syrup at 32° by addition of glucose instead of sugar. Repeat this operation twice. At the next boiling increase the strength of the syrup to 33° by adding more glucose. This operation is repeated until the syrup is found to remain at 33° after four days contact with the fruit, which will show that they have absorbed all the sugar possible. The cherries should then be transparent and full of light and colour. (*Food Manuf.*, November 1957, p. 537).

Insecticide emulsifiers: Emulsol Chemical has developed a pair of low cost, high quality emulsifiers, Emcols H-900 and H-902, for insecticide formulations.

Emcols H-900 and H-902 may be used separately or in combination for a number of insecticides, among them aldrin, BHC, chlordan, DDT, dieldrin, endrin, heptachlor, lindane, parathion, methyl parathion, and toxaphene. (*J. agric. Fd. Chem.*, January 1958, p. 66.)

Safflower oil: Safflower oil has attracted increasingly wide interest in recent years as a highly concentrated source of unsaturated essential fatty acids in nutrition. It has the highest content of unsaturated fatty acids of any commercially available vegetable oil, averaging 70 per cent linoleic acid. Recently published medical and nutritional research reports indicate beneficial effects of linoleic acid in lowering blood cholesterol levels and, in turn, possible reduction in individual tendencies toward atherosclerosis. (*J. agric. Fd. Chem.*, January 1958, p. 66).

Enzyme for separating DL-amino acids: Acylase I, an enzyme obtained from hog kidneys and said to be capable of separating many synthetic DL-amino acids more economically than possible by chemical means, is available in developmental quantities from the research division of Armour.

Acylase I deacylates acyl-L-amino acids without affecting the corresponding acyl-D-amino acid. The liberated L-amino acid can then be separated from the unreacted D-amino acid derivative by solvent extraction or ion exchange. (*J. agric. Fd. Chem.*, January 1958, p. 66.)

I.S.I. CERTIFICATION MARKS

The Indian Standards Institution has granted licences to Messrs. Bharat Pulverising Mills Private Ltd., Bombay in respect of the following products:

1. BHC Dusting Powders—IS:561.
2. BHC Water Dispersible Powder Concentrates—IS:562.
3. DDT Dusting Powders—IS:564.
4. DDT Water Dispersible Powder Concentrates—IS:565.

India requires large quantities of pest control products in combating diseases in rearing animals, and for saving plants from the attack of pests. These materials are being increasingly produced in this country and if any consumer has any complaint about the quality of BHC and DDT bearing these Certification Marks, he should immediately contact the licensee as well as the Indian Standards Institution, 'Manak Bhavan', 9 Mathura Road, New Delhi.

NEW INDIAN STANDARDS

Eucalyptus oil: The Indian Standard Specification for Oil of Eucalyptus (Revised) (IS:328-1957) is a revision of a tentative Indian Standard on the subject originally published in 1952.

The revised Indian Standard prescribes the requirements and the methods of test for the ordinary grade of material employed commercially in perfumery and as an emulsifying agent as well as for the grade of material used in pharmacy. The British Pharmacopoeia (1953) prescribes a minimum cineole content for eucalyptus oil for pharmaceutical purposes at 70 per cent, but in the Indian Pharmacopoeia (1955) this limit for Indian Oil has been kept at not less than 60 per cent. In the tentative Indian Standard IS: 328-1952, the limit for cineole content was placed at 55 per cent as desired by the then Indian Pharmacopoeia Committee. This limit has now been raised by the Indian Pharmacopoeia Committee to 60 per cent. The Pharmacopoeia of India also prescribes values for specific gravity and refractive index which are slightly different from those prescribed in the tentative Indian Standard which has now been revised so as to bring it in line with the requirements prescribed in the Pharmacopoeia of India (1955) (*ISI Bull.*, January 1958, p. 33).

Pest control products: The problem of pest control has a world wide importance. The Indian Standards Institution has also planned to cover a long series on the pest control chemicals, of which 15 have already been published. The following two Indian Standard Specifications are recent additions to the series:

(1) IS: 1053-1957 Dieldrin Water-Dispersible Powder Concentrates.
(2) IS: 1054-1957 Dieldrin Emulsifiable Concentrates.

The specification for Dieldrin Water-Dispersible Powder Concentrates stipulates the requirements for particle size and suspensibility after accelerated storage, and acidity or alkalinity. Since the dieldrin content of the material depends upon the purpose for which it is used, only tolerances on the nominal content of dieldrin have been specified in the standard.

Dieldrin water-dispersible and emulsifiable concentrates containing varying percentages of the active principle are largely used in the control of insect pests of medical, veterinary and agricultural importance.

In the Specification for Dieldrin Emulsifiable Concentrates, physical requirements, such as cold test, flash point, emulsion stability and limits for acidity and alkalinity of the material have been specified. In order to ensure that this material will stand storage under subtropical and tropical conditions, heat stability test for ensuring stability of the material under these conditions has been specified.

These Indian Standards also specify the method of packing and marking, and methods of test for the various requirements, specified in each. (*ISI Bull.*, January 1958, p. 33).

DRAFT INDIAN STANDARDS

Rodenticide formulation: The rodenticide formulation of zinc phosphide is widely used in the country as a stomach poison for the control of bandicoots, rats and mice. The material is obtained by mixing 4 parts by weight of technical zinc phosphide and one part by weight of potassium antimonyl tartrate (tartar emetic). Zinc phosphide, on coming in contact with gastric juices produces phosphine gas inside the stomach which kills the animal. The addition of potassium antimonyl tartrate in the material is actually a safety measure for prevention of casualities in the case of accidental intake of the material by human beings—potassium antimonyl tartrate acting as an emetic on human beings but not on rodents.

The draft Indian Standard Specification for Zinc Phosphide Rodenticide Formulation prescribes the requirements, such as sieving, zinc phosphide content and potassium antimonyl tartrate content and the methods of sampling tests for these requirements. (*Bull.*, January 1958, p. 36).

Corn flakes: The draft Ind Standard Specification for flakes specifies limits for moist total ash, acid insoluble ash, c fibre, alcoholic acidity and rancid of extracted fat, sampling proced and tests for these requiremen It also envisages the enrichment corn flakes with thiamine, riboflav and niacin, with a view to impro ing the nutritional status of consumers. The draft stand also takes note of relevant rul issued by the Government of Ind under the Prevention of Food Adu teration Act, 1954. (*ISI Bul* January 1958, p. 36).

PATENTS

Indian

59878. *A wet starch manufac turing process:* Subjecting star bearing grain to steeping and cracking and feeding the material to high speed rotating rotor disc.—Patented by Corn Products Refining Co. (*Res. & Ind.*, December 1957, p. 333).

56465. *Improvements in foodstuffs:* A small proportion of an ester or an aliphatic hydroxy carboxylic acid (C_{18}-C_{14}) and a mono-, di- or trivalent alcohol (1-5 carbon atoms) is incorporated in an oleaginous foodstuff.—Patented by Unilever Ltd. (*Res. & Ind.*, December 1957, p. 333).

61213. *Process for increasing the stability of ascorbic acid:* Coating with high primary alcohol containing 12-18 carbon atoms.—Patented by E. Merck Aktiengesellschaft. (*Res. & Ind.*, January 1958, p. 21).

57437. *A process for the production of a mineral supplement for the cattle:* The supplement is formed by bone meal chalk, dicalcium phosphate and common salt. —Patented by Pal, Shahi and Sen. (*Res. & Ind.*, January 1958, p. 21).

58703. *Insecticidal compositions:* Consisting of DDT and as synergist *p*-chlorobenzene sulphonic acid N-diethylamide.—Patented by State

Israel and Neeman. (*Res. & l.*, January 1958, p. 21.)

57286. *Improved fungical pre- ations containing a basic copper t:* Alkaline earth metal carbo- e particles coated with a basic pper salt film.—Patented by ons Pest Control Ltd., (*Res. Ind.*, January 1958, p. 21).

58058. *Improvements in the puri- ation of sewage and industrial uents:* The liquid of be purified is ssed through a blanket of coagu- ing agents suspended undisturb- in the tank, the blanket being epared before exposure of the herent mass to flowing liquid.— tented by Griffin. (*Res. & d.*, January 1958, p. 22).

Foreign

781,343. *Dough moulding:* A ethod of rolling up dough com- ises the step of feeding a strip of ugh lengthwise into contact with travelling surface, the direction of ed being perpendicular or obli- ely opposed to the direction of ovement of the surface, whereby e strip is deflected and bent rough at least 90° as it comes into ntact with the surface and is rried along thereby and then gaging the leading portion of the ugh strip as it passed along with e surface and causing it pro- essively to fold back on to the rface of the advancing strip and roll the strip up on itself.— atented by K. Kemper. (*Food rade Rev.*, November 1957, p. 42).

781,620. *Frozen fish:* In the ormal production of frozen por- ons of meat from vertebrate, articularly fish such as fish fillets e pieces of fresh fish are first eighed to a standard weight by e time-wasting method of subs- tuting larger pieces for smaller ieces and *vice versa* and then laced in flat boxes to support them uring freezing between cold plates nd under slight pressure. It has een found that it is possible by ubjecting the fish musculature in resh condition to relatively high ressures, to effect a deformation whereby muscle fibres are displaced relative to each other in the longitudinal direction without the occurrence of discernible damage in the tissue, and consequent loss of quality: the pressing operation produces a homogenous block having a substantially even specific gravity and capable after freezing of being devided into suitable portions by volume; the cumbersome weighing and filling of the freezing apparatus with the boxes of weighed portion is thus obviated.—Patented by Norsk Frossenfisk. (*Food Trade Rev.*, November 1957, p. 42).

782,222. *Food batters:* Relates to a reconstituted replacement composition for natural cereal flour for the preparation of moist batters and doughs adapted to make a resultant batter and dough which will substantially withstand starch liquefication during storage periods: the composition comprises a cereal product containing essentially only an intimate admixture of dry, discreate, comminuted wheat starch particles free of diastatic enzymes, small and broken starch cells and mould spores, and a smaller proportion of dry discrete, comminuted undenatured gum gluten also substantially free of diastatic enzymes and mould spores.—Patented by Pillsbury Mills, Inc. (*Food Trade Rev.*, November 1957, p. 42).

782,580. *Bottling machines:* Relates to an improved filling valve for use in a bottling machine in which filling is effected with the application of gaseous counter-pressure. —Patented by L. C. Snelling (London), Ltd. (*Food Trade Rev.*, November 1957, p. 42).

782,869. *Baking powder:* An improved baking powder composition having the characteristics of substantially increasing the ratio of carbon dioxide evolved in the baking stage to that evolved in the batter stage, and a reduced amount of cornstarch without loss of stability, comprises a mixture of an alkali metal bicarbonate, calcium sulphate, sodium aluminium sulphate and monocalcium phosphate. —Patented by General Food Corporation. (*Food Trade Rev.*, November 1957, p. 42).

782,832. *Cereal products:* In the production of a coated cereal product, the method comprises the steps of heating or toasting small pieces of cereal, e.g., puffed wheat or puffed rice, preparing a sugar solution to provide a cooked syrup, mixing and agitating the heated cereal product and the cooked syrup in a heated container in required proportions, discharging the coated articles and cooling them, and effecting separation. — Patented by Quaker Oats, Ltd. (*Food Trade Rev.*, November 1957, p. 44).

782,848. *Storing fruit:* Relates to a method of regulating the carbon dioxide content of the atmosphere in a fruit storage chamber, which comprises withdrawing gas from the chamber, circulating it in contact with an aqueous solution of triethanolamine, said contact being effected with the solution at a temperature that carbon dioxide is absorbed from the gas by the solution, and returning the gas to the chamber, circulating the solution through a zone of relatively higher temperature so that at least some of the carbon dioxide absorbed is expelled again, and returning the solution to contact with the gas. —Patented by J. and E. Hall, Ltd. (*Food Trade Rev.*, November 1957, p. 44.)

782,857. *Egg cleaning machine:* An apparatus for cleaning eggs has a worm conveyor which rotates the length of the machine, the eggs being moved by the upwardly rotating side of the worm conveyor. An endless belt which passes through a water through comes into contact with the eggs and wipes them as they are being moved along by the worm conveyor of the mechine. Passing the end of the belt, which is made of towelling or some such material, the eggs meet another belt which is not immersed in water and which wipes the eggs dry. A bar is incorporated to prevent the eggs being thrown out of the worm conveyor.

The eggs are directed to a padded chute down which they roll to a platform which is perforated, allowing a draught of warm air to dry the eggs. The air, which may be heated if necessary, is fed through a duct by a fan.—Patented by J. R. McConnell. (*Food Manuf.*, November 1957, p. 538).

781,568. *Preserving fruits and vegetables:* Fruit or vegetables may be preserved by a method in which a modified form of pectin (containing only 20-40 per cent of esterified carboxyl groups) is dissolved in an aqueous liquid by circulating the liquid through a duct system having an inlet for the introduction of the modified pectin. The aqueous liquid contains sugar to the extent of 10-30 per cent by weight of the final jelly weight. The pectin is fed in continuously or intermittently in powder or granular form to merge with the circulating liquid at such a rate as to avoid the formation of undissolved patches. A suitable salt of a divalent metal or other precipitating agent—calcium chloride or calcium citrate are good examples—is added while the temperature of the liquid is above that at which precipitation will take place and in such quantity as to avoid liquid precipitation taking place. The fruit or vegetables are then immersed in the aqueous liquid, which is cooled to precipitate and set the jelly.—Patented by British Canners Ltd. (*Food Manuf.*, November 1957, p. 538).

781,584. *Vinegar manufacture:* A new process of vinegar manufacture is claimed to include the preparation and use of an acetic acid bacterium which has not hitherto been identified. A pure culture of *Acetobacter operans* is obtained by plating out acetic acid bacteria which are in an actively multiplying condition, in a solidifying medium, which serves to separate the individual cells. The bacteria are incubated until visible colonies appear and the *Acetobacter operans* are selected by a defined technique. The *Acetobacter operans* are notable for their ability to produce acetic acid from an alcohol nutrient at an outstandingly high rate.

Vinegar is manufactured by acetification of alcoholic liquor using *Acetobacter operans* at a controlled temperature within the range of 75°-95° F., the apparatus and the equipment employed being sterilized before the operation begins. The alcoholic liquor is circulated through support material (birch twigs) carrying the bacteria at a speed such that the temperature rise between the top and the bottom is between 4°-6°F., the liquid being cooled before it re-enters the acetifier.

Sufficient air is introduced into the acetifier to keep pace with the rate of acetification which is obtained using *Acetobacter operans*. This speed, when using a nutrient medium containing sufficient alcohol, is not less than 20 kg. per cu. m. of ordinary beech wood shavings per 24 hour at 30° C. A final acidity of not less than 9 per cent
acid can be achieved.—Pat
by British Vinegars Ltd.
Manuf., November 1957, p.

C.F.T.R.I. NEWS

The following distinguished
sonalities visited the Institute
ing April 1958:

Dr McRae and Dr Evan
Glaxo Research Laboratories,
land. (Also addressed the Semi

Dr G. Sicault, Deputy Exec
Director (Planning) of UNIC
and Mr T. C. Davis, Area Chi
UNICEF at Delhi. (Also addre
the Seminar).

Shri B. V. Baliga, Minister
Labour and Legal Affairs, Gove
ment of Mysore. (Also presi
over the Annual Day of the In
tute Gymkhana).

Lt. Col. Jaswant Singh, Direct
General of Health Services, N
Delhi, (Chairman) and 15 memb
(from different States) of the C
tral Committee for Food Standar

Sardar Mohan Singh of P
Drinks (Coca Cola), New Delhi.

Dr C. A. Schillinglaw of Co
Cola, U.S.A.

Dr Hicks of Coca Cola, Austr
and 15-20 representatives of vario
food industries who participated
the deliberations of the C.C.F
meeting.

Shri H. S. Rudrappa, Minis
for Agriculture, Government
Mysore.

INDIAN FOOD LAWS (*published in August 1954*) pp. v + 220.

This volume summarizes all important details regarding the history, operation and enforcement of the food laws existing in different States in India, definitions, descriptions and chemical standards for articles of food including permissible additives, (colours, flavours and preservatives) and labelling of foodstuffs. The large number of tables on the comparative chemical standards prescribed for different food commodities in various parts of the country make the book useful for reference and guidance for the public analysts and the legal profession.

Price: Indian, Rs. 4.50 (*postage extra*); Foreign, 10 shillings; $1.75

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

The relation between the uric acid content and the extent of kernel damage in insect infested grain, by Venkata Rao, S., *et al.*, *Food Sci.*, 1957, **6** (12), 273.—Data regarding the kernel damage, number of insect exit holes and uric acid present in Bengal gram and field bean samples infested by *Bruchus* sp. have been presented. The results indicate that the uric acid content of the infested samples can be better correlated with the number of insect exit holes than with kernel damage. The uric acid present in 100 g. of the samples containing seeds with different number of holes has been determined. In both infested Bengal gram and field bean, the uric acid is found to increase with the number of holes. R.C.B.

Use of 2-3-5 triphenyl tetrazolium chloride for assessing the quality of fish, by Moorjani, M. N. *et al.*, *Food Sci.*, 1957, **6** (12), 275.—The authors have observed that for a particular group of fish (*Cirrhina fulungee*, *Barbus carnaticus*, *Wallago Attu*, *Barbus Dubious* and *Labeo. sp.*, the influence of the species of fish, the pH of the reaction mixture and the incubation periods can be considerably reduced by using the optimum conditions which help to reduce the tetrazolium chloride being converted into farmazon. The method has also been applied to assess the quality of non-fat freshwater fish and shrimp. These results are based on the organoleptic evaluation, studies on bacterial counts, trimethylamine, total volatile basis and volatile reducing substances. The method, ho fails in the case of fish contai appreciable quantity of trimet amine oxide which exerts a poi action on the oxidation red potential of fish.

R.C

Preservation of vegetables salting, *Food Sci.*, 1957, **6** (276.—The article surveys mater and equipment required in process of vegetable salting, dif ent steps in the preparation of vegetable before preservation the different methods of preser tion by salting which include salt and heavy brine methods and without fermentation and fina the storage techniques used each method of preservation.

R.C.B.

PART II (Indian)

ANALYTICAL

Oxidation of methionine with hydrogen peroxide vapour: Its application in paper chromatographic analysis of the amino-acid, by Datta, J., *et al.*, *Ann. Biochem. Exptl. Med.*, 1957, **17**, 211.—Advantage has been taken of an observation that spots of methionine on filter paper, when exposed to vapours from a dilute H_2O solution in a closed chamber at room temperature (25-33° C), are easily oxidised within a reasonably short period. The product of oxidation has been identified by unidimensional chromatography in water-saturated phenol, in *n*-butanol-acetic acid-water, and in pyridine-isoamyl alcohol-water to be methionine sulphoxide; no methionine sulphone is formed.

Two precautions are necessary. First, standard spots of the two amino-acids should always be included along with the unknown in the same chromatogram to avoid any possible sheet-to-sheet variation in the ninhydrin colour. Secondly, as methionine on paper is slowly oxidised to methionine sulphoxide, on exposure to air, the sheet in which the total colour intensity of this amino-acid *plus* valine is to be determined should not be left exposed to air for an unnecessarily long period.

R.C.B.

ADHESIVES

Adhesives from Acacia Cutch, by Narayanamurthi, D., Ramachandra Rao, P. and Rulia Ram, *Res. and Ind.*, 1958, **3** (1), 6.—Cutch from the heartwood of *Acacia catechu*, which is obtained as a bye-product in the Indian *katha* industry, has been found to be useful as a raw material for plywood adhesives. A typical adhesive contain cutch, 100 g.; water, 80 g.; par formaldehyde, 10 g.; alkali (NaOH 1.5 g.; and wood flour, 5 g. Satis factory results have been obtain with the glue under the followi pressing conditions: temperatu 120° C; pressure, 200 lb. sq. i and more time of pressing, minutes. The adhesive compare favourably in cost with simil adhesives which are in use. Gi adhesion test results with differe species of wood are given.

BIOCHEMISTRY AND NUTRITION

Inhibitory effect of steroi hormones on salivary amylase activity, by Narayan Rao, S. *Indian J. med. Res.*, 1958, **46** (39.—The normal amylase activity of human saliva and the inhibitory effects of desoxycorticosterone acetate, progesterone and testosterone propionate have been studied. The first two hormones have good inhibitory effect, while the last has a slight one.

Blood glutathione levels in the diabetic, by Surendra K. Lal and Shiv Kumar, *Indian J. med. Res.*, 1958, **46** (1), 47.—Blood sugar and glutathione values have been determined in 94 normal adults and 26 cases of *Diabetes mellitus*. Since blood glutathione values show a considerable variation even in an homogenous group, it is concluded that deviation from *normal* must be large to be of diagnostic significance. In the diabetics studied, the average concentration of GSH and total glutathione was appreciably lower as compared to the normal. Statistically, GSH bears a negative significant correlation with blood sugar in normal persons indicating that a high content of blood sugar generally reflects a lower GSH level. No such correlation has been observed in the diabetics.

Effect of 'Nadisan' on the course of alloxan diabetes in rats and rabbits, by Mukherjee, S. K., De, U.N. and Mukerji, B., *Indian J. med. Res.*, 1958, **46** (1), 57.—Previous feeding of Nadisan to albino rats fails to prevent the diabetogenic action of alloxan.

Long continued feeding of Nadisan cannot cause any regression in alloxan induced diabetes of albino rats or rabbits. Nadisan therapy is equally ineffective, whether instituted early or late after the induction of the disease.

An experimental study of the effect of some drugs on temperature in normal and pyretic rats, by Saxena, P. N. and Khanna, B. K., *Indian J. med. Res.*, 1958, **46** (1), 63.—The effect of two 2, 3-disubstituted quinazolones, 2-methyl - 3-phenyl - 4 - quinazolone (QZ-1) and 2-methyl-3-orthotolyl-4-quinazolone (QZ 2) on the rectal temperature of normal and fevered rats has been studied and comparatively evaluated with that of phenobarbitone, chlorpromazine, acetyl salicylic acid, ACTH, cortisone, desoxy-corticosterone and combination of cortisone and desoxycorticosterone.

The quinozolones showed a greater hypothermic than antipyretic effect and their temperature lowering effect appeared to be not related to their hypnotic effect.

The effect of QZ-1 and QZ-2 on body temperature in normal and fevered rats resembled that of chlorpromazine hydrochloride. An investigation of QZ-1, the more potent of the two quinzolones, with a view to its possible use of producing therapeutic hypothermia has been suggested.

Nutrition and tuberculosis, Part I. An epidemiological study, by Jayalakshmi, V. T. and Gopalan, C., *Indian J. med. Res.*, 1958, **46** (1), 87.—The incidence of tuberculin positivity in a group of 548 malnourished children aged up to 10 years has been compared with the incidence of tuberculin positivity in a group of apparently normal children of the general population.

The relative incidence of tuberculosis and kwashiorkor in children of the same socio-economic groups has been studied.

The significance of these observations has been discussed.

Mode of action vitamin D. Healing of experimental rickets by starvation and associated biochemical changes, by Dikshit P. K., Joshi, J. G. and Patwardhan, V. N., *Indian J. med. Res.*, 1958, **46** (1), 113.—Young albino rats were fed a rachitogenic diet for 21 days and then were starved up to a period of 48 hours. Observations were made during this period on the healing of rickets, changes in citrogenase activity and citrate and total phosphorus in the epiphyseal cartilage.

Starvation induced healing of the rachitic lesion; maximum healing was observed at 48 hours.

The healing process was unaccompanied with increases in citrate or citrogenase activity in the epiphyseal cartilage. The total P content of the latter, however, increased significantly up to 36 hours.

Starvation of rachitic rats caused a fourfold increase in the plasma citrate.

The significance of the above findings has been discussed. A tentative hypothesis of a common pathway of action of starvation, citrate and vitamin D in the healing of rickets has been presented.

A follow-up study of fifteen cases of 'Kwashiorkor', by Srikantia, S. G., Sriramachari, S. and Gopalan, C., *Indian J. med. Res.*, 1958, **46** (1), 121.—The results of the follow-up study of 15 cases of kwashiorkor are presented. The investigation included a histopathological examination of the liver biopsy specimens of all these children.

Protein-deficiency type of vacuolation of the liver cells, which could be corrected by dietary protein supplementation was the predominant finding. Evidence of increased fibrous tissue formation was significantly absent.

Liver function, as judged by the serum albumin and serum cholesterol levels, appeared to be unimpaired.

DAIRYING

Vitamin A in dairy products. Part VI. Stability of carotene and vitamin A in colostral fats during storage, by Narayanan, K. M. and Anantakrishnan, C. P., *Indian J. Dairy Sci.*, 1957, **10**, 165.—The stability of carotene and vitamin A in colostral fat during storage was studied over a period of 4 months at 37° C.

No difference was noticed in the storage quality of colostral fat kept in glass, aluminium and tinned iron containers except samples stored in mud-pot which showed signs of deterioration in vitamin A even within a month of storage and complete loss of vitamin A by the end of 4 months.

Carotene and vitamin A in colostral fat are less stable on storage than normal milkfat.

In general, addition of hydroquinone as an anti-oxidant reduced the extent of destruction of carotene and vitamin A and development of peroxides in colostral fat during storage.

The initial concentration of carotene, vitamin A and tocopherol in the colostral fat had no relation to their stability on storage.

The development of peroxides in a fixed period was relatively more in colostral fat than in milkfat and this was more so in cow colostral fat than in the buffalo.

Effect of stage of lactation on the composition of buffalo milk and the correlation between milk constituents, by Asker, A.A., Ragab, M. T. and Kamal, T. H., *Indian J. Dairy Sci.*, 1957, **10**, 204.—Over 700 samples of milk were collected from the buffalo herd belonging to the Animal Production Department, Faculty of Agriculture, University of Cairo, during 2 seasons (1952-54). Forty complete lactations obtained from 30 animals were utilized for this study.

Milk samples were taken fortnightly from evening and morning milk of each buffalo to study the effect of stage of lactation on milk yield, butterfat, protein, chloride, solids-not-fat and total solids contents as well as on specific gravity. The relationship between milk yield and milk components was also investigated.

The average butterfat, protein, solids-not-fat, total solids percentages were 6.37, 3.87, 10.03 and 16.40 respectively. The average for the chloride content was 61.00 mg./100 g. of milk, while it was 1.0336 for specific gravity. Minimum values were obtained at the 3rd, 17th, 11th and 9th weeks for fat, protein, chloride and total solids respectively. These components showed thereafter a gradual increase which was more pronounced at the end of lactation period. The specific gravity and solids-not-fat content decreased throughout the whole lactation period reaching the minimum in the 39th week of lactation. The average daily milk yield for buffaloes studied was 14.6 lb. and the maximum daily production was attained at the 5th week.

The correlation co-efficients between milk yield and butterfat, total solids, protein and chloride percentages were negative and statistically significant. The correlation coefficient between daily milk production and solids-not-fat was significant. A high and positive relationship was found between milk yield and the yield of milk constituents.

FRUITS AND VEGETABLES

Vitamin C content of some Darjeeling fruits and vegetables, by Sarkar, S. R., *Ann. Biochem. Exptl. Med.*, 1957, **17** (6), 215.—The present note gives the vitamin C contents of amla (*Phyllanthus emblica*), guava (hill variety) and some varieties of green chillies that are grown in and around Darjeeling town. The time lag between plucking and the analysis of the fruits was normally 24 hours while that for fruits collected from Sikkim was 48 hours.

The results show that there is no correlation between vitamin C content and altitude in any of the fruits studied. The vitamin C content of guava appears to increase with the degree of ripeness. The guavas of Darjeeling areas seem to possess much higher vitamin C values than those of Coonoor area in South India, whereas *amla* possesses low values. The vitamin C content of the three varieties of chillies stated above shows much lower values than the globular varieties of the same fruit reported upon by the author elsewhere.

R.C.B.

MICROBIOLOGY

The incidence of coliform organisms in damietta cheese and its relation to the salt content and acidity, by Sadek, G. M. and Eissa, A. M., *Indian J. Dairy Sci.*, 1957, **10**, 184.—One hundred samples of market Damietta cheese were examined as regards their coliform count, salt content and titratable acidity.

As regards coliforms count, 100 samples could be divided the following categories or gra Grade A: 26 samples containin coliforms in 0.5 g. of cheese; G B: 29 samples in which colifo were absent in 0.1 g. but preser 0.5 g.; Grade C: 10 samples taining coliforms in 0.1 and 0.01 g.; and lastly, Grade D: samples containing coliforms 0.01 g. of the cheese.

Estimation of the salt cont and the titratable acidity of the samples of market cheese revea wide variations in the 2 constitue The former varied from 2.126 10.2156 per cent and the lat from 0.12 to 1.50 per cent.

A study of the effect of the content on coliforms count sho that it is only effective in suppre ing these organisms when in co centration higher than 9.5 per cer

Further, the relation betwe acidity and coliform count revea that a degree of acidity higher th 1.2 per cent had an inhibitory effe on the growth of the organism Accordingly suggestions were forward to help suppressing harmful effect of these organisn in this type of cheese.

FATS AND OILSEEDS

Project costs: The cottonsee industry, by Chari, K. S., Saletor S. A. and Zaheer, S. H., *Res.* *Ind.*, 1958, **3** (1), 1.—The preser position of the cottonseed indu in India is critically reviewed. is pointed out that there is immediate need for starting number of composite units for complete utilization of cottonsee The steps involved in processi the seed are detailed and the costi for processing 100 tons per day American variety of seed has bee worked out. The problems cottonseed industry in India examined and the steps taken stimulate the development of cottonseed oil industry in county are enumerated.

SALTS

Sodium chloride A. R. and B. P. from marine salt,

Mehta, D. J., Shukla, B. K. and Vaidya, M. C., *Res and Ind.*, 1958, 3 (1), 5.—A process is described for refining marine salt to A. R. and B. P. grades of sodium chloride. The bulk of soluble impurities, present in marine salt, are removed by washing. A saturated solution of the washed salt is then prepared and treated with calcium oxide and sodium carbonate to remove the residual impurities. Fractional crystallisation from purified solution yields salt of the required grade. Yield of A. R. Salt, 33 per cent; cost per lb. ex-works, Rs 1.75 (A. R.); Rs 1.35 (B. P.).

PART III (Foreign)

ANALYTICAL

A spectrophotometric determination of 2- (p-tert-Butylphenoxy)-1-methylethyl 2-Chloroethyl sulfite (aramite) residues, by Brokke, M. E., Kiigemagi, U. and Terriere, L. C.; *J. agric. Fd. Chem.*, 1958, **6** (1), 26.—Aramite residues as low as 0.1 p.p.m. on 100-gram samples can be determined by a method which depends on the breakdown of aramite to ethylene oxide. The ethylene oxide is trapped and converted to formaldehyde which is determined colorimetrically. Interferences are negligible and recoveries are good.

Effect of light on chemical and biological properties of parathion, by Frawley, J. P. *et al.*, *J. agric. Fd. Chem.*, 1958, **6** (1), 28—The exposure of parathion to ultraviolet light gives rise to a mixture of compounds possessing greater in vitro anticholinesterase activity than parathion, but lower reactability to the Averell-Norris chemical method and lower toxicity to flies. As similar conversion might occur on crops sprayed with parathion, the ability of the method to detect all toxic residues was in question. Therefore, samples of parathion and ultraviolet light-exposed parathion were fed subacutely to rats, and the in vivo anticholinesterase activity was found to parallel closely the loss in response to the Averell-Norris chemical method.

Analysis of mixtures of isomers of demeton, by Kermit Groves, *J. agric. Fd. Chem.*, 1958, **6** (1), 30.—The isomers of demeton (O,O-diethyl O (and S)-ethyl-2-mercaptoethyl phosphorathioate) are determined in their mixtures by titration with bromine before and after alkaline hydrolysis. The reliability of the method is shown by the results of titrations of known mixtures of the isomers and related compounds. Duplicate analyses can be made in less than 40 minutes.

Spectrophoto fluorometry for pesticide determinations, by Irwin Hornstein, *J. agric. Fd. Chem.*, 1859, **6** (1), 32.—A number of organic pesticides have been shown to fluorescence in the ultraviolet region. Maximum activation and fluorescence wave lengths are reported. These measurements, which offer a greater degree of specificity to fluoremetric analysis, are possible because of recent improvements on instrumentation. The lower limit of sensitivity for the compounds exhibiting fluorescence is about 0.01 γ per ml.

Quantitative determination of peroxidase in sweet corn, by Vetter, J. L., Steinberg, M. P. and Nelson, A. I.; *J. agric. Fd. Chem.*, 1958, **6** (1), 39.—A procedure is described for the quantitative determination of peroxidase in whole-kernel sweet corn. The method involves the colorimetric determination of the colour formed when the enzyme oxidizes orthophenylenediamine in the presence of hydrogen peroxide. Starch is removed from a buffered extract of corn by alcohol precipitation and centrifugation. The absorption curve for the oxidized dye shows a maximum absorbance at 430 mμ under the conditions used in this assay. The colour formed from the peroxidase-catalyzed oxidation of the orthophenylenediamine follows the Beer-Lambert law if a correction term is applied for the nonenzymatic oxidation of the dye. The assay is independent of the sample weight used for colour development. Enzyme activity was determined in corn which had been steam blanched for various periods from 0 to 8 minutes. Enzyme activity decreased with increasing blanch time.

Determination of food tannins by ultraviolet spectrophotometry by Owades, J.L., Rubin, G. and Brenner, M. W.; *J. agric. Fd. Chem.* 1958, **6** (1), 44—The need for simpler and more accurate methods for the quantitative determination of tannins prompted the development of a direct procedure based on the ultraviolet absorption of these compounds. The tannins are extracted with ethyl acetate, and, after evaporation of solvent, are taken up in acidified methanol. The absorbance of the methanol solution is measured at 270 mμ. The method was developed for tea and beer, but may be applicable to other materials as well.

Quantitative inorganic chromatography. Part III-The separation and determination of ferrous and ferric iron, by Pollard, F. H., McOmie, J. F. W., Banister, A. J. and Nickless, G.; *Analyst*, 1957, **82** (981), 780.—The method of selecting a solvent system suitable for the separation of various metals in different valency states is described. The optimum composition of this solvent system for the separation of ferrous and ferric iron has been investigated and a detailed study made of the experimental variables that affect this separation.

A comparative study has also been made of methods for the quantitative determination of ferrous and ferric iron after separation by paper chromatography. The preferred method involves extraction of the metal from the paper and colorimetric measurement after complexing with 2-nitroso-1-naphthol-4-sulphonic acid.

The ratios of iron^{II} to iron^{III} investigated were between 25 to 1 and 1 to 49, and the method was found to be applicable to amounts ranging between 25 and 1250 μg of iron^{II} and between 25 and 2450 μg of iron.^{III} The maximum error expected for any single determination was between 1 and 4 per cent, depending upon the amounts present and the ratio of iron^{II} to iron^{III}.

A new type of graduated capillary dropper that delivers, almost instantaneously, minute amounts of liquid (about 1 to 3 μl) is described. The application of the new chromatographic technique to the determination of iron in mixtures with chromium, manganese, cobalt, nickel and copper is indicated. Salicylaldehyde is used as a sensitive spray reagent for the detection of manganese.

The use of selective desorption from carbon columns for the determination of dextrose and maltose in starch conversion products, by Patterson, S. J. and Savage, R. I., *Analyst*, 1957, **82** (981), 812.—A method is proposed for determining the mono- and disaccharides in starch conversion products, based on selective desorption followed by elution from a carbon column. Recovery is quantitative provided the most suitable temperature conditions for recovery from each batch of carbon are established before it is put into routine use. The method of testing the carbon in order to obtain these conditions is described.

3-Amino-l-propanol as a complexing agent in the determination of total gossypol, by Pons Jr. W. A., *et al.*, *J. Amer. oil Chem. Soc.*, 1958, **35** (2), 93.—A method is proposed for the determination of total gossypol in cottonseed meals, crude oils, and soapstocks based on a rapid extraction of gossypol by neutralized 3-amino-1-propanol in dimethylform-amide to form a stable complex, followed by colorimetric analysis of an aliquot of the extract by means of an aniline reaction. A determination can be completed in about 2 hours and with minor modification in 1 hour compared to about 7 hours for current methods. Results obtained by the proposed procedure on meals, oils, and soapstocks are in essential agreement with those found by use of other accepted methods. Desirable features, such as stability of reagents and extracts and a high degree of reproducibility, suggest that the procedure will satisfy the requirements for a rapid and simplified method for the analysis of all cottonseed products for total gossypol.

The chromatographic separation and estimation of certain pasture lipoids—II—Tocopherol by Worker, N. A., *J. Sci. Fd. Agric.*, 1958, **9** (2), 122.—A method is described for the extraction and chromatographic separation of tocopherol from pasture. Extraction is carried out using acetone in the cold, and separation is effected by means of double chromatography on magnesia and alumina. Estimation is colorimetric. The method is simple and quantitative and is suitable as a routine procedure.

BIOCHEMISTRY AND NUTRITION

The effects of biologically unavailable lysine (heated casein) on growth-I. Body weight and bone growth, by Edith Koyoumdjisky, *J. Nutr.*, 1957, **63** (4), 509-521.—A temporary growth cessation, expressed in lowered body weight (allowing of endochondral bone formation) takes place in animals fed adequate diets in which the sole source of protein is heated casein.

The imbalance produced by the diet induces a uniform retardation in the formation of both skeletal and soft structures, under the conditions in which this experiment was carried out.

The changes occurring during the period of retardation are reversible and self-correcting without supplementation of the diet.

Effects of protein per ca
ratio and dietary level of f
calorie and protein utiliza
by Yoshida, A., Harper, A. E.
Elvehjem, C. A.; *J. Nutr.*, 1
63 (4), 555.—The effects of cha
in the protein per calorie rat
the diet and in the level of d
fat on growth, body gain per ca
consumed and body gain per g
of nitrogen consumed have
examined using young rats fe
diets containing casein as the so
of protein.

Total gain and gain per ca
consumed increased gradually
each increase in protein per cal
ratio up to a level of 60 mg.
protein per calorie. The optim
protein per calorie ratio for gr
and calorie utilization is prob
above this when casein is the diet
protein.

The body gain per gram
nitrogen consumed increased t
maximum at between 20 and
mg. of casein per calorie and t
decreased. This maximum, wh
would be determined by the nut
tive value of the protein, represe
the point of optimum calorie utili
tion per unit of nitrogen consum

The evidence obtained indica
that the fat content of the d
influenced neither the percentage
ingested nitrogen retained nor t
efficiency of calorie utilizati
There did appear to be some tran
tory beneficial effect of additio
fat in stimulating food consumpti
and growth during the first week
the experiment when the prot
per calorie ratio was held consta

The average calorie intake p
unit of body weight to the
power was almost constant rega
less of the protein or fat content
the diet.

It has been concluded that calo
utilization and nitrogen utilizat
in the growing rat are not affec
appreciably by the fat content
the diet but that protein to calor
ratio is an important factor to
considered in interpreting
measurements.

The effect of thyroid activit
on the conversion of carote
and retinene to vitamin A an

on serum proteins, by Cama, H. R., Pillai, N. C., Sundaresan, . R. and Venkateshan, C., *J. Nutr.*, 1957, **63** (4), 571.—The effect of odinated casein, thiourea and thiouracil on retinene and carotene metabilism in rats has been investigated.

Iodinated casein decreased whereas thiourea increased the liver storage of vitamin A on feeding retinene, but thiouracil did not show any significant effect. There was no significant difference in total vitamin A in livers between the iodinated casein and thiourea groups, when retinene was injected intravenously. On feeding carotene, hyperthyroid rats stored more nd hypothyroid rats less vitamin A n the liver than the controls.

The changes occurring in the different components of serum proteins, in vitamin A-deficient, hyperthyroid and hypothyroid rats have been shown. In vitamin A eficiency a very low albumin level nd a significant increase in α_2-, β_2- and γ-globulin levels are bserved. In hyperthyroidism, here is a decrease in the albumin nd an increase in the α_2- and β_2-globulins. In hypothyroidism an ncrease in the α_1-globulin is noted.

Effect of partial pantothenic cid deficiency on reproductive erformance of the rat, by Barboriak, J. J., Krehl, W. A., Cowgill, G. R. and Whedon, A. D., . *Nutr.*, 1957, **63**, (4), 591.—The ffect of long-term feeding of subptimal amounts of pantothenic cid on the reproductive performnce of the rat was investigated. Male and female weanling albino ts were fed a pantothenic acid-eficient diet for 4 weeks to deplete hem of the vitamin stores and then hey were supplied with 0.2, 0.5, 8 and 2.0 mg. of calcium pantohenate per 100 g. of diet. Serious natomical and functional impairments of testes with resulting loss of ertility was noted in male rats eceiving the lowest vitamin supplement. In female rats, decreased rtility, litter resorption and malormation, and retarded development of young were observed on the two lowest vitamin levels, without any significant concomitant histological changes in the ovaries.

Nutrition studies in the cold-I. Influence of diet and low environmental temperature on growth and on the lipid content of livers in the rat, by Treadwell, C. R., Flick, D. F. and Vahouny, G. V., *J. Nutr.* 1957, **63** (4), 611.—Immature and young adult male rats received a series of 8 choline and inositol-free diets varying in protein content from 5 to 40 per cent (with 20 per cent fat) and in fat from 10 to 40 per cent (with 20 per cent protein). Parallel groups were maintained at 1° and at 25°C.

With the immature rats at 5 and 10 per cent protein levels the growth rate and protein efficiency ratio were higher at 1° than at 25°. The reverse was true at protein levels of 20, 30 and 40 per cent. The growth rate was higher at 25° than at 1° on the 10, 20 and 30 per cent fat levels. With 30 per cent fat the growth rate was higher at 1°.

At 25° the liver lipids in the immature rats were highest on the 5 per cent protein diet and dropped regularly and sharply up to 30 per cent protein. At 1° the liver lipids were essentially the same at all protein levels and were in the normal range for the rat. Increasing the fat content of the diet from 10 to 40 per cent produced a regular increase in liver lipids at 25° while at 1° there was no significant change and the liver lipids were in the normal range at all fat levels.

The observations on the young adult animals were qualitatively the same as for the immature rats. The dietary requirement for lipotropic factors appeared to be lower at 25° for the adult animals.

The food and calorie intake was higher at 1° for both groups of animals. The mechanism of the lipotropic effect of cold is discussed.

Varietal differences in amylose content of rice starch, by Williams, V. R. *et al.*, *J. agric. Fd. Chem.*, 1958, **6** (1), 47.—The study of the amylose content of a number of southern rice varieties was undertaken as part of a more extensive investigation of quality control in rice products. These analyses have revealed a consistent variation of amylose content with grain type, the longer grain varieties having the higher amylose content. Possibly, this difference in starch composition is responsible for the known differences in cooking quality. Studies on samples of different seeding dates have so far revealed no significant differences in amylose content attributable to date of planting.

COLD STORAGE

Food additives and frozen foods, by Davison, F. B., *Austr. Food Manuf.*, 1958, **27** (7), 20.—The use of a wide range of substances as additives in the manufacture of frozen foods is becoming a matter of ever increasing importance as this rapidly developing section of the Austialian food industry reaches growing dimensions. The use of additives arises essentially from a desire to improve the product and facts unearthed by research workers throughout the world show that a need for new and better additives exists.

Changes that occur in frozen foods—physical and chemical—affect the colour, taste and aroma of the product and in order to produce a product as near as possible, to a freshly produced article, it is necessary to use additives to achieve these results. In certain cases more than one such additive may be needed, *e.g.*, sugar and ascorbic acid.

Quick-freezing in air blast tunnels and plate freezers, by Schweitzer, W., and Wildridge, R., *Austr. Food Manuf.*, 1958, **27** (7) 26.—The two principal methods of quick freezing of food products in Australia and overseas are by air blast freezers or plate freezers (contact freezers). The quick freezing in air blast is based on heat exchange between the food to be frozen and the air flowing at high velocity over the food. These freezers are called freezing tunnels, chambers or carussel freezers, etc., depending on how the food is transported through the freezer.

FRUITS AND VEGETABLES

Effect of variety, location, and years on the protein and amino acid content of dried beans, by Lantz, E. M., *et al.*, *J. agric. Fd. Chem.*, 1958, **6** (1), 58.—As previous work had shown variety and environmental variations in the protein content of dried beans, nine amino acids were determined microbiologically in eight varieties of dried beans grown for 3 years in one location and for 1 year in three locations. Differences due to location and years were highly significant for all amino acids on milligram-per-gram basis and for seven and six amino acids, respectively, on a per-cent-of-protein basis. For some amino acids, variety differences, which were significant on a milligram-per-gram basis, were not significant when expressed as per cent of protein. The arginine content was affected much more than the other amino acids. The fact that the relative amounts of an amino acid affects its biological value may be significant in planning dietaries of population groups eating large amounts of dried beans.

Nutritive values and utility of passion fruit by-products, by Otagaki, K. K. and Matsumoto, H., *J. agric. Fd. Chem.*, 1958, **6** (1), 54.—Passion fruit rinds and seeds, by-products of the juice industry, present a serious disposal problem. Experiments involving milch cows, wethers, and rats were conducted to determine the nutritive value of passion fruit by-products as animal feeds. Milk production, feed efficiency, digestion test, and growth data were used as criteria of evaluation. The oil from passion fruit seed was chemically and physically characterized. The by-products were satisfactory for supplementing or supplanting the carbonaceous feedstuffs for dairy cows. The seed oil can also be used to supply the fat requirements of animals.

Through-circulation drying of vegetable materials. III. Carrots, by Mitchell, T. J. and Potts, C. S., *J. Sci. Fd. Agric.*, 1958, **9** (2), 93.—The drying of carrots has been investigated in single-layer tests. The effect of particle size (slices, cubes and strips), temperature (110-160° F), humidity (up to 45 per cent R.H.) and air velocity (8—155 lb./sq. ft./min.) on the drying rates of single layers has been studied. The drying rate is proportional to the total moisture content of the layer. Calculated times of drying of deep beds, based on single-layer experimental results, are within ± 10 per cent of the actual times.

Through-circulation drying of vegetable materials. IV. Peas, by Mitchell, T. J. and Potts, C. S., *J. Sci. Fd. Agric.*, 1958, **9** (2), 99.—The drying rates of peas, in single layers and in deep beds, have been studied at different air temperatures (110-150° F), humidities (6 per cent and 40 per cent R.H.) and air-velocities (8-23 lb. of dry air/sq. ft./min.)

Observations have been made on the evidence of case hardening and the influence of humidity upon it.

An approximate prediction method, based on single-layer results, is proposed for the drying times of deep beds.

Citrus fruit products: Their role in the soft drinks, by Priest, C. S., *Austr. Food Manuf.*, 1958, **27** (7), 16.—The fruit of the lemon has a greater variety of uses in the soft drinks industry than any other citrus, producing as it does oil for the production of what is probably the world's most popular soft drink—lemonade. The natural high acidity of its juice makes it a common ingredient in many fruit based syrups.

MICROBIOLOGY

Processing of raw cocoa. I. Small-scale fermentation, by Rohan, T. A., *J. Sci. Fd. Agric.*, 1958, **9** (2), 105.—Quantities small as 20 lb. of wet beans can b successfully fermented during t main crop season, which, in Gh is from September until January.

Fermentation of cocoa in hea does not take place uniforml throughout the mass. Easier acc of air at the surface results in more rapid temperature rise and earlier death of the beans. T effect of turning should be to com pensate but it is not yet known i complete uniformity can be obtai ed even with mixing.

Reduction of batch size is accompanied by proportionately greater air penetration and a corresponding increase in uniformity. It was found that, with very small batches, the fermentation time could be reduced and that mixing had no noticeable effect on the quality of the product.

The presence of purple beans in fermented and dried West African Amelonado cocoa is not necessarily deleterious. It is probably preferable to have a product showing a degree of purple rather than completely brown since, to achieve the latter effect, prolonged fermentation is required with the danger of loss of cocoa flavour. In beans which have been fermented for at least 4 days, the anthocyanin concentration after drying was reduced to less than 5 per cent of that initially present.

The duration of fermentation is related to batch size and where small quantities, up to approximately 250 lb. of wet beans, are fermented, the recommended 6 days is unnecessarily long. With large heaps it is possible that longer fermentation times are required to increase the uniformity of the product.

Qualitative chromatographic analysis has shown that West African Amelonado contains two principal anthocyanins, four catechins and three leucocyanidins.

FATS AND OILSEEDS

Amino-Hexose-Reductones as Antioxidants. I. Vegetable Oils,

by Evans, *et al.*, *J. Amer. Oil Chem. Soc.*, 1958, **35** (2), 84.—Aminohexose-reductones were evaluated as antioxidants in soybean, cottonseed, and corn oils and were shown to be highly effective by all oxidative and chemical tests. The activity of the eight different reductones was approximately the same in any one substrate. Slightly higher activities were given by reductones of lower molecular weight. Activity was demonstrated at concentrations as low as 0.001 per cent and was shown to be a linear function of the concentration up to 0.02 per cent, the approximate limit of solubility. Outstanding features of the reductone-treated oils were long induction periods, slow absorption of oxygen, and low rates of peroxide development. Reductones are believed not to react directly with peroxides but to prevent peroxide formation by reacting with some precursor.

The combination of reductones with other antioxidants showed synergistic effects in only one sample of corn oil. The activity of combinations in soybean and cottonseed oils was for the most part strictly additive. In soybean oil, citric acid-reductone combinations with each at the 0.01 per cent level gave a slight improvement over the expected activity. Oils stabilized with multiple-component antioxidant mixtures in which an amino reductone replaced propyl gallate showed less peroxide development and were equally acceptable according to organoleptic scores. Aged oils did not show the organoleptic improvement that would be expected from the marked improvement observed in the oxidative stability. Significant improvements in flavour stability could be observed with reductones only when they were used in combination with another antioxidant. Reductone-treated soybean and cottonseed oils did now show an appreciable improvement in flavour stability. Only the di-n-butylamino- and diallylamino-reductones contributed foreign flavours to the oil. A typical flavours are believed associated with the amine moiety of the reductone.

At high temperatures and at higher concentrations of reductones a brown melanoid colour develops in the oil. The anhydro derivatives developed more colour than the normal reductone. The reductones do not withstand oil deodorization conditions.

Further studies on the isomerization of polyunsaturated fatty acids by potassium tertiary butoxide, by Sreenivasan, B. S. and Brown, J. B., *J. Amer. Oil Chem. Soc.*, 1958, 35 (2), 89.—A temperature and time study revealed that the best conditions for the isomerization and estimation of polyunsaturated acids are heating in a sealed tube for 2 hours at 140° with potassium-t-butoxide in t-butanol. Under these conditions conjugation of linolenic and arachidonic acids appears to have attained completion. With linolenic acid a higher degree of conjugation than by other methods and a shift of peak to lower wavelength (231-232 mμ) are observed. Extinction co-efficients obtained by this method for isomerized pure linolenic (K_{232}, 98.0) and linolenic (K_{268}, 138.4) acids are the highest so far reported. Ultraviolet and infrared examination of the conjugated trienes isolated from isomerized linolenic acid concentrate showed that, under these conditions, trienes similar to both alpha-and beta-eleostearic acids are produced. Analyses of samples of oils for component polyunsaturated acids, by this method, compare well with those by other methods. The presence of small amounts of a tetraenoic acid in linseed oil is noted.

Pilot-plant preparation of edible safflower oil, by Beal, R.E., Moser, H. A., and Brekke, O.L., *J. Amer. Oil Chem. Soc.*, 1958, **35** (2), 97.—Tests conducted on a pilot-plant scale with two lots of commercial, alkali-refined safflower oil demonstrate that no difficulty is experienced in producing a salad oil of good, initial quality with good flavour stability when stored at 60° C in the dark. Although results dicatein safflower oil is suitable for a salad oil, they should not be construed as indicating its stability as a cooking oil since tests of this type were not conducted.

The addition of citric acid improved the oxidative stability of the oil, and citric acid plus propyl gallate gave even further improvement. No significant increase in flavour stability resulted from these additives.

STARCH

The consistency of starch-milk puddings. I.—Preparation of puddings and measurement of consistency, by Rutgers, R., *J. Sci. Fd. Agric.*, 1958, **9** (2), 61.—A standardised procedure for the preparation of starch-milk puddings is evolved and a study is made of various types of apparatus for the determination of the viscosity and consistency of the products. The limitations and applications of the instruments are discussed.

The consistency of starch-milk puddings. II.—Influence of cooking and cooling conditions etc., and type of starch, by Rutgers, R., *J. Sci. Fd. Agric.*, 1958, **9** (2), 69.—The consistency of starch-milk puddings is discussed with reference to the cooking temperatures of the puddings, composition of the cooking liquid, cooling conditions after cooking, temperature of storage, and sterilization. The effects of the concentration of maize starch and the use of starches other than maize are also examined.

VITAMINS

Variation in carotene content of sweet potatoes, by Ezell, B.D. and Wilcox, M. S., *J. agric. Fd. Chem.*, 1958, **6** (1), 61.—Composite samples of sweet potatoes—averages of 10 replicates of five roots each—taken from different sections of a 7500-square-foot area were found to vary, within a variety, as much as 45 per cent in total carotenoids and 145 per cent in carotene—higher over lowest sample. Sweet potatoes from the same field averaged more than twice as much carotene one season as the next. Those grown with limited soil moisture were higher in carotene than those grown with abundant moisture. Individual roots from the same plant varied in carotene, as much as 47 per cent in Orange Little Stem and 82 per cent in Yellow Jersey. High-yielding plants from a plot averaged significantly higher in carotene content per unit weight than the plot average. The carotene content appears to be more closely associated with rate of growth of the root than with the size attained. Carotene content of harvest was not a determining factor in amount of increase during storage, but in a season all lots were relatively high in carotene at harvest, the increase during storage was also high. The moisture content of sweet potato samples varied up to 3 per cent within a season; differences between seasons were sometimes greater, but the highest moisture content was not necessarily in the season or area of highest soil moisture.

Effect of ascorbic acid in pantothenic acid deficiency, by Barborlak, J. J. and Krehl, W. A., *J. Nutr.*, 1957, **63**, (4), 601.—The influence of ascorbic acid, phthalylsulfathiazole, ascorbic acid and sulfathiazole combined citric acid, and an antibiotic, hygromycin, on the physiological effects of a pantothenic acid-deficient diet were investigated in experiments with male weanling albino rats. The concentration of hygromycin was 100 or 200 mg. per kilogram of diet: each of the other test substances was used at a 2 per cent level.

The presence of either ascorb acid or hygromycin in the pantothenic acid-deficient diet delayed o suppressed the appearance of deficiency signs. Sulfathiazole, fe simultaneously with ascorbic acid counteracted the beneficial effect of the ascorbic acid. The addition of citric acid did not seem to influenc significantly the effect of the basal deficient diet. The histological picture of the adrenals and testes, as well as the distribution of blood serum proteins, were affected markedly by the supplements. It is concluded that the favourable effect of ascorbic acid is probably a secondary one, mediated through changes in the intestinal microflora, and that these changes may not be identical with those observed when feeding hygromycin.

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EFFECT OF PARTIAL REPLACEMENT OF RICE IN THE DIET BY ENRICHED WHEAT MACARONI ON THE GENERAL HEALTH AND NUTRITIONAL STATUS OF CHILDREN

By V. Subrahmanyan, R. K. Bhagavan, T. R. Doraiswamy, G. S. Bains, D. S. Bhatia, A. N. Sankaran and M. Swaminathan

(*Central Food Technological Research Institute, Mysore.*)

Macaroni products like vermicelli have long een used in India as an article of diet in special od preparations. At present vermicelli is being anufactured only on a cottage industrial-scale nd the other macaroni products are being nported. As such the cost of these is somehat high. Italy is the leading producer and istributor of macaroni products and over 250 roducts of different shapes and sizes are on the orld market. These are quite popular in urope and America. The main advantages of acaroni products are: (1) they can be easily ooked in the same way as rice yielding a soft roduct like cooked rice, (2) they lend themselves being prepared into a variety of dishes (3) ey can be easily fortified by the addition of ssential vitamins, minerals and protein rich foods us enhancing their nutritive value.

Subrahmanyan, *et al*[1-3] reported studies on the reparation and nutritive value of a balanced od in the shape of broken vermicelli from a lend of corn starch, low fat groundnut flour, asein and fortified with minerals and vitamins. ecently, methods have been standardised at the Central Food Technological Research Institute, Mysore, for the production of fortified macaroni products using wheat flour as the base and fortifying the product by the addition of low fat groundnut flour, calcium, and essential B-vitamins. Consumption of 3-4 ounces of the product daily will make up the common deficiencies in poor Indian diets. The product can be used as a food for invalids and convalescents who require more protein, calcium and B-vitamins than normal individuals. It can also be incorporated in the diet of young children in place of common cereals. When produced on a large scale the product will be available at a cost of 7 or 8 annas per pound.

OOD SCIENCE JUNE 1958

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Recently the production of enriched wheat macaroni has been carried out on a pilot plant scale in this Institute with a view to ascertaining the consumer acceptability of the product on a large scale and to assess its value as a supplementary food to the diets of children. The present paper deals with studies on the effect of replacing 50 per cent of rice in the diet by enriched wheat macaroni on the general health and nutritional status of children.

Experimental

Enriched wheat macaroni was prepared on a pilot plant scale from a blend of wheat semolina, 80 parts and low fat groundnut cake flour 20 parts (and fortified with essential B-vitamins and calcium) according to the process employed in the manufacture of macaroni products[4]. The mixed ingredients were kneaded after the addition of cold water till a dough of proper consistency was obtained. This was extruded in a macaroni press provided with dies of different shapes and a machanical cutter. The product was dried at 60°–70° C in a blast of air in a continuous drier (specially designed fabricated and supplied by Messrs Buhler Bros, Uzwil).

Chemical composition of macaroni: The composition of enriched wheat macaroni is given in Table I. The proximate principles and minerals were estimated according to the methods of the Association of Official Agricultural Chemists. Thiamine and nicotinic acid were determined according to the method of Swaminathan[5-6] and riboflavin according to the method of the Association of Vitamin Chemists[7].

TABLE I. *Chemical composition of enriched wheat macaroni*
(Values per 100 g.)

Moisture (g)	11.7
Protein (g)	19.3
Fat (g)	2.5
Ash (g)	2.9
Carbohydrate, by difference (g)	63.6
Calcium (g)	0.39
Phosphorus (g)...	0.17
Iron (Fe) (mg)...	1.4
Thiamine (mg)	0.59
Riboflavin (mg)	1.04
Nicotinic acid (mg)	7.6
Calories	354.0

Cooking of enriched wheat macaroni: Enriched wheat macaroni can be cooked in the same way as rice. The method of cooking adopted in the present experiment was as follows: The required quantity of macaroni was added to 5 times the quantity of boiling water and the mixture allowed to boil for 8-10 minutes with occasional stirring during which period the grain was fully cooked. The excess gruel was drained off through a sieve. The cooked macaroni as well as the gruel were given to the subjects along with the rest of the diet.

Selection of subjects: A boarding home containing 65 girls (ages ranging from 4–15 years) was selected as the venue of the experiments. The girls belonged to poor class of society and hailed mostly from the nearby villages. Their general nutritional status was better than that of similar children living in villages with their parents. This was due to the fact that the diet of the boarding home was more nutritious than that ordinarily consumed by poor classes of people, who are always undernourished and therefore would respond to any diet irrespective of its quality. Of these all the girls below 12 years of age were clinically examined and 36 girls between 4 and 11 years of age and free from diseases likely interfere with the experiment were selected experimental subjects. They were treated f worms two weeks before starting the experimen

Physical measurements and assessment nutritional status: Height, weight, nutritio status, R.B.C. count and haemoglobin content blood of the subjects were determined accordi to the methods described in an earlier paper Height was recorded to the nearest 1/8″ and weig to the nearest 1/8 lb. On the basis of these dat the children were paired and the members of eac pair were allotted at random to two groups c eighteen.

Composition of experimental diets and feedi of children: A diet survey was conducted accor ing to the procedure described in an earlier paper The pattern of the diets consumed by the tw groups is given in Table II. The boarding hom

TABLE II. *Pattern of the diets consumed by children under experiment*

Food-stuffs		Daily intake per child (g)
Control group:	Rice raw, milled	40
Experimental group:	Rice raw, milled	20
	Enriched wheat macaroni	20
Basal diet common to both groups:	*Pulses:* (Red gram *dhal* (*Cajanus Indicus*) and field beans)	47
	Vegetables: (Drum sticks leaves, raddish tops, fenugreek leaves, amaranthus tender, radish white, potato, brinjals, papaya green)	[illegible]
	Condiments: (Red chillies, coriander seeds, penugreek, cumin, garlic and turmeric)	2.8
	Tamarind pulp	3.7
	Onion	5.6
	American butter oil ...	7.1
	Cheese	7.1
	Cocoanut kernel	1.1
	Jaggery	7.1
	Common salt	7.1
	Meat	11.4
	Skim milk powder ...	34.0

The average consumption unit for both groups was c and was calculated using the international scale of family co-efficients. (League of Nations Health Organisatio —1932).

iet ordinarily contained cereals, pulses, and egetables, small amounts of milk and meat.)ccasionally the boarding home receives free ıpplies of skim milk powder, cheese and Amerian butter oil through UNICEF. At the time hen the experiment was planned, the children ere receiving supplements of skim milk powder, merican butter oil and cheese. As the boarding ome authorities were not willing to stop the upplements, all the children continued to receive hese supplements throughout the course of the xperiment. The nutritive value of the diets calulated using the figures given by Aykroyd, atwardhan and Ranganathan[9] together with he dietary requirements of children of similar ge groups suggested by the Indian Council of Medical Research, Nutrition Advisory Comnittee are given in Table III.

The subjects were fed three times a day. The attern of breakfast, lunch and dinner was imilar to that described in a previous paper[8]. ll the children relished the macaroni preparaions. None complained of any digestive trouble luring the entire experimental period. The xperiment was begun in June 1957 and lasted or a period of 6 months at the end of which the eight, weight, nutritional status, R.B.C. count nd haemoglobin were again determined.

TABLE III. *Average daily intake of different nutrients by the children under experiment*

Nutrients	Control group	Experimental group	N.A.C. standard*
Calories ...	1,867	1,879	2,000
Protein (g) ...	58.9	83.7	57
Fat (g) ...	12.4	16.6	...
Carbohydrate (g) ...	380.7	349.0	...
Calcium as (ca) (g)	0.73	1.49	1 to 1.5
Phosphorus as (P) (g) ...	1.05	1.16	...
Iron (mg) ...	13.0	13.7	10 to 30
Vitamin A (I.U.)...	352	352	3,000 to 4,000
Vitamin A as carotene (I.U.)...	3,498	3,498	
Thiamine (mg) ...	0.60	1.57	0.5 to 1.0
Riboflavin (mg) ...	0.92	2.84	1.80†
Vitamin C (mg) ...	45.9	45.9	30 to 40

* Recommendations of the Indian Council of Medical Research: Nutrition Advisory Committee, 1944.

† Recommendation of the National Research Council, U.S.A.: Food and Nutrition Board, 1948.

Results and Discussion

Table IV shows the initial and final values of the different measurements, together with results of statistical analysis. It will be seen that at the commencement of the experiment the two groups of subjects were closely similar. For the purpose

TABLE IV. *Average values of the initial and final measurements of children in the control and experimental groups*

(18 children per group)

Character	Control group			Experimental group			Difference in the increase (experimental minus control)
	Initial	Final	Increase	Initial	Final	Increase	
Height (Inches)	51.02	51.81	0.79	51.07	52.05	0.98	0.19±0.14*
Weight (Pounds)	50.33	54.37	4.04	49.99	56.70	6.71	2.67±0.76†
Haemoglobin (g/100 cc)	12.16	11.81	−0.35	11.84	12.32	0.48	0.83±0.17‡
Red Blood cell Count (mil/cu.mm)	4.45	4.38	−0.07	4.38	4.46	0.08	0.15±0.10

* Standard error of the mean based on 17 degrees of freedom.

† Significant at 1 per cent level.

‡ Significant at 0.1 per cent level.

of statistical analysis the increase in the various measurements during the experimental period were obtained for each group. The differences in the average increase between the two groups were tested by the 't' test appropriate for paired comparisons. It will be seen from Table IV that the increase in all the characters *viz.*, height, weight, haemoglobin and R.B.C. count in the experimental group were larger than those in the control group, the differences being highly significant in the case of weight and haemoglobin. From Table V it will be seen that 13 out of the 18 children in the experimental group improved in nutritional status as against only 4 in the control group.

Summary

1. A feeding experiment extending over a period of 6 months was carried out on thrity six girls aged 4-12 years in a boarding home in Mysore to assess the effect of replacing 50 per cent of rice in their diet by enriched wheat macaroni composed of wheat semolina (80 parts) and low fat groundnut flour (20 parts) and fortified with certain B-vitamins and calcium.

2. The children were paired accordin initial heights and weights and the member each pair allotted at random to the control experimental groups. Values of weight, hei nutritional status, haemoglobin level and red bl cell count, were obtained at the beginning end of the experiment for subjects in the cont and experimental groups receiving rice diet a rice-macaroni diet respectively.

3. The results of statistical analysis showe significant improvement in the weight and haen globin of children receiving the enriched wh macaroni over those in the control gro Thirteen children in the experimental gro showed improvement in nutritional status against only four in the control group.

Acknowledgement

Our thanks are due to the authorities of th Mary Calvert Boarding Home, Mysore, for pro viding facilities for conducting the experimen and Miss K. Indiramma for help in the statistic analysis of the results.

Table V. *Nutritional status of children in the control and experimental groups*

Nutritional deficiency score*	Initial nutritional status of children		Changes in the nutritional status of children					
			Control group			Experimental group		
	Control group	Experimental group	Improved	Stationary	Deteriorated	Improved	Stationary	Deteriorate
	No. of children		No. of children			No. of children		
0	1	1	..	1	...	...	1	...
1	3	4	1	2	...	3	1	...
2	6	4	2	4	...	3	1	...
3	5	6	...	5	...	5	1	...
4	2	2	1	1	...	1	1	...
5	1	1	...	1	...	1	...	...
Total	18	18	4	14	...	13	5	...

* According to the recommendations of the Indian Council of Medical Research: Nutrition Advisory Committee (1948).

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ALCOHOLIC EXTRACTION OF OILS—III. WHEAT BRAN OIL

By Y. K. Raghunatha Rao and R. G. Krishna Murthy

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Wheat bran which forms 13 to 15 per cent of wheat is obtained as a by-product in the wheat milling industry. It contains usually 14-16 per cent of proteins and 3-6 per cent of lipids and is used as a cattle feed. The bran as obtained from local mills, contains some wheat germs also. Alcoholic extraction of the lipids has been carried out, to study the extent of recovery of the oil and a low-fat extracted bran. It is considered that the oil extraction may prove beneficial both for the prolonged storage of the bran as well as for obtaining a valuable oil.

Materials and Methods

Commercial wheat bran was obtained from a flour mill in Bangalore and on account of the usual delays in transit, the bran was 3-6 days old when taken for extraction. Industrial alcohol (85-95 per cent by weight) was employed as a solvent. Normal hexane was also used for comparative studies.

A rotary extractor was designed and made for extraction under pressure. It consists of a steam jacketed M.S. drum, 2′ dia. × 3′ long, provided with an internal mixer, driven at 60 r.p.m. by a 1 H.P. motor and reduction gear. It is provided with feed inlet, detachable filter and extract outlet. The extractor is rotated manually for discharging the extract and extracted meal. Pressure gauges are provided for the steam jacket and the vapour space of the extractor. The extractor is mounted on a steel frame and concrete pillars 30″ above the ground. Auxiliary equipment consists of a stainless steel heat exchanger, two condensers, extract receivers, extract pump, a stainless steel distillation still with a condenser, alcohol receiver and a vacuum pump. Low pressure steam was supplied by an electrode boiler.

Experimental

The bran (30-109 lb.) was put into the extractor. The bran originally contained 8.8 to 13 per cent moisture and 4 to 6 per cent lipids as ether extractives. Sufficient ethyl alcohol was added to cover the bran and the stirrer started to mix the two and to form a thin slurry. The entire mass was heated during 15 to 30 minutes by introducing steam at 5-15 p.s.i.g. in the jacket, the vapour outlet being closed. The internal pressure developed, was indicated by the pressure gauge and it ranged from 15 to 25 p.s.i.g. The extractor was then rotated bringing the liquid outlet to the bottom and the extract was allowed to flow out under its own vapour pressure; it was cooled through the heat exchanger and led into the receiver. Extraction was repeated, once or twice, with fresh solvent. The collected extracts were distilled in the still under atmospheric pressure and solvent traces in the oil were finally removed under vacuum. The residual oil and the sugar syrup remaining at the bottom of the still were collected. The solvent vapours were condensed and the solvent recovered. The extracted meal was then desolventised in the extractor, by heating with indirect steam for 1 to 2 hours and the solvent recovered. The final drying of the bran was carried out under 25″ vacuum. Extractions with hexane were similarly carried out with pre-dried bran at room temperature (25° C). The extraction results are shown in Table I.

TABLE I

Solvent	Alcohol		Hexane	
	95%	93%	a	b
Weight of bran (lb) ...	30	109	100	104
Oil % (M.F.B.) ...	4.47	5.39	6.0	6.0
Oil in bran (lb) ...	1.2	5.22	8.52	6.16
Moisture % bran ...	10.56	11.2	3.00	1.35
Moisture in bran (lb) ...	3.17	12.2	3.00	1.3
Alcohol % wt. ...	95	93	...	...
Solvent used (lb) ...	108	360	200	375
Solvent to bran ratio ...	3.6	3.3	2.00	3.6
Extrn. temp. °C. ...	100	100	25	25
No. of extractions ...	2	3	2	3
Yields				
Oil (lb) ...	0.98	4.12	5.0	5.8
Oil % bran ...	3.27	3.76	5.0	5.57
Sugar (lb) ...	0.55	3.62	...	...
Sugar % bran ...	1.8	3.3	...	...
Extracted meal (lb) ...	25.3	90.0	92.0	96.8
Extracted meal % bran ...	84.3	82.5	92.0	93.1
Residual oil % meal ...	1.0	1.25	0.9	0.32
Extraction efficiency				
Oil extracted % oil in bran	81.6	78.9	85.9	90.4

Results and Discussion

Drying of bran samples with an initial moisture content of 10.1 per cent down to 1.3 per cent moisture took 1 to 2 hours. Cold hexane extraction at 25° C with solvent ratios of 2.0, 2.4 and 3.6 yielded oil-extraction efficiencies of 85.9, 86.1 and 90.4 per cent. Hot alcoholic extraction of the original bran with 10.5 per cent moisture, at solvent ratios of 3.3 to 3.6 gave oil extraction efficiencies of 78.9 to 81.6 per cent. Extraction of bran pre-dried to 1.3 to 2 per cent moisture, by absolute alcohol were not tried but could be expected to give 90 to 97 per cent extraction efficiencies, as in the extraction of pre-dried rice bran[2].

Wheat bran oil: The extracted wheat bran oil was dark brown in colour and contained 6.3 to 10.8 per cent free fatty acids; whereas Soxhlet extraction of a freshly milled bran sample locally obtained, yielded an oil with 3 per cent free fatty acids. The oil refining loss[4] by alkali refining ranged from 15.8 to 42.3 per cent. The refined oil was light brown in colour[5]. It was bleached by Fullers earth and then partly de-odourised by passage of steam through the oil heated to 180° C under 5 mm. vacuum during 2 hours. The characteristics of the oil are shown in Table II. The tocopherols were estimated by the modified method of Emmerie and Engel[3].

TABLE II. *Characteristics of wheat bran oil*

Characteristics	Alcohol extracted	Hexane extracted	Values from literature
n^{25}_D ...	1.478	1.475	1.480
Sp. gravity 26° ...	0.9236	0.9249	(15°C)0.92995
Iodine no. (wijis) ...	125	127—125	118
Sap. value ...	185	184	188
Un-sap. matter % ...	6.1	6.04	4.3
Titer (°C) ...	26.5	26.5	54.2
Tocopherol % ...	0.04—0.24	0.06	...
Lovibond colour in			
1-cm. cell Y ...	30.0	30.0	...
R ...	4.0	8.0	...

Sugars: Yield of the by-product raw sugar was 1.5 to 3.3 per cent in extractions by 95 and 93 per cent alcohol. The raw sugar was analysed chemically and chromatographically unpublished data. It consisted of a mixture of sucrose (69 per cent), reducing sugars (16 per cent), raffinose, galactose, melibose and arabinose. It also co tains several B-vitamins, which are under stud

Wax: The alcohol-extracted crude oil depos ed about 3 per cent of wax which w recovered by centrifuging. The cold h extracted oil deposited 1 to 2 per cent wax an the dewaxed oil gave very little precipitate o addition of acetone.

The wax has acid value 24.5, iodine value 66.2 saponification value 119.9 and melting point about 45° C.

Extracted bran: The alcohol-extracted m contained a residual oil of 1 to 1.25 per cent an the hexane extracted meal 0.32 to 0.9 per cen The bulk density of the wheat bran was 20.2 lbs per cu. ft. and that of the extracted bran was 19. to 20 lb. per cu. ft. The sieve analysis of th extracted bran is shown in Table III. Th extracted bran has kept well in storage for severa months without off-odour or mould formation.

TABLE III. *Characteristics of wheat bran*

Characteristics	Original	Extracted
Bulk Density lb/cu. ft. ...	20.2	19.5—20.0
Moisture (%) ...	8.8—13.1	—
Sieve analysis		
(Passing mesh) ...	(%)	(%)
0 — 16 ...	0.0	0.0
16 — 30 ...	48.0	46.0
30 — 60 ...	52.0	42.0
60 — 100 ...	0.0	0.0
Over 100 ..	0.0	12.0

Conclusion

Extraction with alcohol has shown that about 4 per cent oil may be recovered from the commercial bran. Further studies are in progress.

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RETENTION OF β-CAROTENE DURING THE PREPARATION OF CARROT PRESERVE

By M. V. Sastry and G. S. Siddappa

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Carrot preserve is an important article of commerce in India. Recently carrots have been canned in syrup also[1]. Since carrots are rich in β-carotene, it is of considerable interest to study its retention during their preservation. The results of an investigation on the changes that take place in the β-carotene content during the preparation of carrot preserve are presented here. This forms one aspect of a systematic investigation on Indian preserves. Bhatia and Siddappa have reported the β-carotene content in some Indian preserves[2].

Experimental

Tender carrots obtained from the local market were used. They were graded for size and maturity, peeled and blanched for 15 minutes in boiling water. They were then pricked by means of a stainless steel fork. Two hundred gram lots were weighed into nine glass beakers and covered with sugar syrup of 28° Brix. The beakers were covered with watch glasses. Each day the Brix of the syrup was raised by addition of calculated amount of sugar, the syrup with carrots heated for about 5 minutes and then set aside. On each day one of the beakers was withdrawn for the estimation of β-carotene in the contents. The Brix of the syrup was noted. The process of addition of sugar and heating was repeated every day till the final concentration of the syrup reached about 70° Brix, which is generally the strength of the syrup in the finished preserve. The incremental rise in the strength of the covering syrup was about 10° Brix on each occasion.

β-carotene was estimated in the preserve by extraction with acetone and taking up in petroleum ether and measuring on a Lumetron as per details given in *Methods of Vitamin Assay*[3]. At higher sugar concentration stages, the sugar was leached out with warm water and the water rejected. This facilitated the extraction of carotene with acetone.

Results and Discussion

The results are shown in Table I. The percentage retention of β-carotene has been calculated on the basis of the original β-carotene content of the carrots. It will be seen that fresh carrots have a high β-carotene content and that the loss of carotene during processing is gradual. This loss is the highest between stages of the process when the syrup strength is between 28° and 33° Brix, i.e., during the very early stages of the process. The total loss of β-carotene during the complete process is 50-55 per cent. Thus only about half the amount of it originally present in the fresh carrot is retained at the end of the preserve making process. Even after this loss, the carrot preserve is still a rich source of β-carotene. Further work is in progress to study any further changes in the carotene content of the preserve during the subsequent processes of packing and storage.

TABLE I. *Retention of β-carotene during the preparation of carrot preserve*

Stage of preserve making	Syrup strength at 20°C (°Brix)	Weight of drained carrot (g)	β-carotene in the drained carrot (mg/100 g.)	β-carotene in the total weight of drained carrots (mg.)	Retention of β-carotene (%)
Raw carrots	0	200	10.12	20.24	100.0
Blanched carrots ...	0	195	9.72	18.95	93.7
1st stage ...	28	224	8.61	19.29	95.3
2nd ,, ...	33	224	6.27	14.05	69.4
3rd ,, ...	41	232	5.39	12.50	61.8
4th ,, ...	47	244	4.98	12.18	60.2
5th ,, ...	53	243	4.90	11.91	58.8
6th ,, ...	56	248	4.38	10.86	53.7
7th ,, ...	62	240	4.18	10.03	49.6
8th ,, ...	63	244	4.08	9.96	49.2
9th ,, ...	69	245	3.87	9.48	46.8

Acknowledgment

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IMPROVED METHOD FOR THE COMMERCIAL PRESERVATION OF RAW MANGO SLICES

By J. C. Anand and D. S. Johar

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India has been exporting large quantities of mango chutney as well as raw mango slices to the United Kingdom and other continental markets for a long time. The raw mango slices are preserved with salt according to traditional methods at certain centres in the mango growing regions of the country and subsequently exported as slices or supplied to chutney manufacturers at Calcutta, Bombay and Madras.

Commercial methods in vogue

The commonly practised method of preserving mango slices at Rajapur (Ratnagiri, Bombay) consists of peeling and slicing the green mangoes, keeping the slices in wooden barrels of 52 gallons capacity with 15-20 per cent of crude marine salt and the whole mass kept pressed under the heavy weight of stones. The supernatant layer of brine containing the leached principles from the slices undergoes spontaneous fermentation with salt resistant species of yeast, and ultimately results in the formation of a layer of '*Mycoderma*' at the surface. After 7-8 days' storage, the liquid from the barrels of the stored slices is drained out by loosening the iron hoops round the barrels. The empty head-space thus formed on the top of the barrels is subsequently filled with cured slices from other similarly treated barrels. An extra quantity of 4-5 lb. of marine salt is then layered at the surface and the barrel closed with the lid.

The method of salting mango slices as practised in the Calcutta region differs slightly from the above in as much as the prepared slices are thoroughly smeared with 5 per cent salt and left in the barrel. After two days the liquid that is formed, is drained out and the process repeated twice until on the whole 15 per cent salt has been added. The cured slices are later packed tightly in 45 gallon capacity wooden barrels and closed with the lid.

After about a year's storage, the slices preserved by either of the above methods are found to be greyish-black, soft and partially shrivelled. Before using these slices for making sweet mango chutney, they are steeped in 1-2 per cent salt solution for 3-4 hours during which time the goo quality slices are sorted out for subsequent and also the excess of salt got rid of.

Improved method developed

An improved method for preserving these slices has been evolved at the Central Food Technological Research Institute, Mysore. It consists in steeping the slices in equal volume of 10 per cent salt solution to which has been added 200 parts per million of sulphur dioxide (the solution can be prepared by adding 11 lb. of salt and 10 g. of potassium metabisulphite to every 10 gallons of water). After about 20 hours the slices are drained out and repacked with 5 per cent salt containing 200 p.p.m. sulphur dioxide in a barrel which is then closed with its lid. To fill the empty space in the barrel completely 5 per cent salt solution with 200 p.p.m. SO_2 is added through the bung hole in the body of the barrel and the bung fixed tightly.

It has been found that the slices preserved by this method retain better colour, texture and other natural characteristics during storage for over a year as compared with the slices preserved by traditional methods. Otherwise also, this new method is more advantageous, as it works quicker and thus saves money on labour. The slices can be finally packed for storage within 24 hours by this method, as against 7-8 days by the commonly used methods. Again the slices preserved by the improved method need no subsequent washing for removing the excess of salt before being converted into chutney. These slices also have longer storage life due to the presence of sulphur dioxide.

Conclusions and Recommendations

It will be further advantageous if the following factors are attended to during the process by the packers of mango slices on bulk scale:

(1) Fruit which has not yet developed stony kernel *i.e.*, it can be easily cut through, should preferably be used.

(2) Injured and damaged fruit should not be used for preparation of slices as it carries very heavy loads of spoilage micro-organisms (mostly fungi).

(3) Fruit should not be held over long periods before peeling and slicing.

(4) The fruit should preferably be washed with water containing small quantities of bleaching powder.

(5) Stainless steel knives should be substituted for the iron ones and improvement should be made in the design of knives to avoid high losses in peeling.

(6) Only good quality white salt in powder form should be used as the pointed edges of small lumps of salt tend to rupture the slices during their tight packing with intermittent layers of salt.

(7) Improved method of salting mango slices as stated above can be used with advantage.

(8) Mango slices preserved with the new method can be used straightaway for the manufacture of chutney and need not be washed free from salt which is not excessive.

(9) Barrels packed with mango slices preserved by the improved method need not be opened again and again for exercising a check on the quality of slices at the time of their export.

(10) To avoid leakage and thereby partial dehydration of slices during storage and transit, these barrels can be lined inside with polyethylene and duly sealed after packing the slices. This will enable the slices not only to retain their shape and size but also colour due to the reducing atmosphere of sulphur dioxide.

(11) There is a scope for efforts being made to evolve lighter and cheaper containers in place of the wooden barrels being used at present for the packing and transport of mango slices.

(12) Use of slightly higher doses of sulphur dioxide in the preservation of slices will not be harmful as most of it will be expelled during the preparation of chutney except a very small proportion which is retained in combination with sugars. The residual sulphur, if any, will further ensure the keeping quality of chutney.

(13) To demonstrate the day-to-day improvements in the preservation of slices and making of chutney, a close liaison should be maintained between the packers, chutney manufacturers and research institutions like the Central Food Technological Research Institute, Mysore.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during April-May, 1958 are given in this section.

S (IS) 12

Some recent work on dehydration of foods in U.K., by B. S. Bhatia (*April* 26, 1958).—A good deal of work was done on dehydration of foods during the Second World War in the United Kingdom and since then considerable progress has been made in pretreatments, drying techniques, packaging and storage life of dehydrated foods. A suitable steam scalding equipment which is capable of introducing dosing solutions at an appropriate stage of scalding has been introduced and this has resulted in increased yield and better storage life of dehydrated vegetables. An improved hot air drying system having first three stages with cross flow drying cabinets and last stage with through flow deep tray drier has been found to show better drying performance than the tunnel driers used during the War. Steam scalding of cabbage has resulted in improved compression technique whereby the cabbage is heated to 165-170° F for a minute, compressed at about 4000 lb./□″ pressure in heated molds and packed in cans. During the War, it was necessary to humidify the material before compressing and dry the final block again in hot air which affected the culinary quality of the product. Improved storage life of about 8-12 months at 37° C is now possible because potatoes, carrots and cabbage of moisture contents as low as 3.5, 2.5 and 1.0 per cent respectively, can be prepared by using in-can-desiccants which only occupy about 10 per cent of can space as against 30 per cent during the War. The most remarkable advance in drying technique has been the method of vacuum contact dehydration developed at the Ministry of Agriculture, Fisheries and Food, Experimental Factory, Aberdeen. It is now possible to prepare good quality raw dehydrated meat and fish of about $\frac{1}{2}$ to $\frac{3}{4}''$ thickness. Porous structure imparted to the products by accelerated freeze drying technique has considerably reduced their reconstitution times. By this method products having as low as 1 per cent moisture can be prepared and this has resulted in improved storage behaviour under tropical conditions. About half inch thick cod fish steak which usually takes about 16 hours to dry by freeze drying method, can be dried in 10 hours by accelerated freeze drying method in the vacuum contact plant. Recent experiments using the expanded metal trays which provide free space for the vapours to escape and reduce the stifling effect of very close contact of plates, have resulted in further reduction of drying time to about 6 hours. Further progress has been made in gas packing technique whereby last traces of oxygen from the cans, can be removed by combining it with hydrogen (introduced along with nitrogen) in the presence of palladium pellet which acts as a catalyst.

The speaker, then referred to some of the work which he carried out while working at Aberdeen. He made the following observations on the rate of dehydration of vegetables in heated air with varying initial drying temperatures ranging from 260° F to 160° F.:

(i) During the first half hour of drying, the speed of water removal is higher at higher initial temperatures and decreases with decrease in temperature. However, the water ratios tend to coincide after $2\frac{1}{2}$ to 4 hours drying; (ii) There is a tendency for case hardening in 1/ inch thick water scalded stri higher initial temperatures of 21 260° F. It is, however, not notic in either thicker pieces (3/16″) o in steam scalded strips; (iii) Ther is no difference in the culinar quality and storage behaviour o products dried at different initia temperatures; (iv) Single cabine system drying continuously at abou 160° F appears to be quite suitabl for vegetables and has the advantage of simplicity and low initial cost but its thermal efficiency is not likely to be as high as in multi-stage system.

Concluding, the speaker described the following inferences drawn from his work on the role of products of non-enzymatic browning on the development of mealiness in dehydrated cooked pork mince during storage in air: (i) No evidence has been found that products of non-enzymatic browning take part in mealiness developed when dehydrated mince is stored in air; (ii) Removal of reducing sugars by yeast fermentation slows down non-enzymatic browning in initial stages only, *i.e.*, upto 3 days storage at 55° C or 4 weeks at 37° C; (iii) Freshly dehydrated cooked pork mince has the reflectance minima at 415-418 and 545 mμ. As mealiness and browning develop during storage in air, the minimum absorption at 545 mμ disappears but one at 415 mμ tends to persist and can be noticed after 6 weeks storage at 37°C.

The talk was then followed by an interesting discussion, where several points were raised *viz.*, high temperature short time blanching, cost of production and comparability with pre-cooked foodstuffs. The President reviewing the discussion said that we can further improve the technique in order to get a cheaper product. He indicated the search for some products which when combined, could absorb the moisture without affecting the flavour of the material.

S (IS) 13

Inhibition of oxidation of L-ascorbic acid by EDTA, by M. V. L. Rao (*May* 19, 1958).—Explaining the genesis of the problem, the speaker, at the outset, mentioned that during certain metabolic investigations on ascorbic acid, the need arose for the preservation of the vitamin in dilute aqueous solutions. In view of the fact that aerobic oxidation of ascorbic acid catalysed by trace amounts of copper in the solvent is mainly responsible for the rapid deterioration in strength of aqueous solutions of the vitamin, the use of EDTA—a well-known metal binder—was thought of as a stabilizer. The initital observations indicated that at low concentrations (upto 2 mM) it fully protected the vitamin for at least 24 hours at room temperature, but at higher concentrations, unexpectedly, it had the reverse effect. Therefore, a systematic study of the inhibition of the oxidation of ascorbic acid by EDTA was undertaken as only a few scattered references were available relating to the use of EDTA as a protectant for ascorbic acid. Experimental data on the rate of oxidation of the vitamin in various acid and buffer solutions with and without EDTA were presented. The results clearly indicated that acidification of the solution to pH 3 and below, (with any acid excepting oxalic and trichloracetic acids) counteracted the effects of excess EDTA and afforded complete protection to the vitamin so that even dilute solutions could be preserved for at least a week at uncontrolled room temperatures (25-27° C). Under optimum conditions, solutions of the vitamin containing EDTA could be preserved even in tap water. Long term observations are now underway.

Furthermore, solutions of ascorbic acid protected by EDTA could be concentrated by direct evaporation on a boiling water-bath and even evaporated to dryness with 100 per cent recovery of the vitamin, which was indeed a noteworthy finding. Further, under optimal conditions, ascorbic acid solutions containing EDTA could be subjected to heat treatment in an autoclave at 15 lb. pressure for 30 minutes without any loss.

A study of the extent of oxidation of ascorbic acid mediated by excess EDTA at pH's above 3, had shown that the oxidation did not extend beyond the 2:3 diketogulonic acid stage, as judged by the recovery of the 2:4 dinitrophenylhydrazone derivative according to the method of Roe and Kuether. Also in such partially oxidised solutions, H_2S—recoverable reducing substance (dye titre) was nearly equivalent to the original ascorbic acid value on standing for 6 hours, but decreased with increasing time and lowering of pH, indicating that the oxidation follows the normal pathway via dehydroascorbic acid.

In conclusion, the speaker emphasized that the use of EDTA in conjunction with suitable adjustment of acidity of solutions obviates the need for triple glass-distilled water and the use of an inert atmosphere for preservation of ascorbic acid solutions. While these are important advantages in the preparation of analytical standards, the remarkable thermal stability that ascorbic acid gains in acidified distilled water containing EDTA could be practically exploited for protecting ascorbic acid in its synthetic production and also in pharmaceutical preparations.

During the discussion that followed, questions were raised regarding the toxicity of EDTA and its permissibility in vitamin preparations and its application for protecting the vitamin in natural sources. Another question asked, was whether acidity was essential for effective chelation of metals with EDTA. In replying to these questions, the speaker mentioned that the need for maintaining adequate acidity in solution was only with specific reference to the use of EDTA for protecting ascorbic acid, both from the point of view of preventing auto-oxidation of the vitamin and counteracting the adverse effects of excess EDTA. With regard to toxicity, although when administered rapidly through the intravenous or intraperitoneal routes and in large doses (100-400 mg/Kg) EDTA caused rapid calcium depletion resulting in tetanic symptoms in experimental animals, published literature showed that in the trace concentrations required for protecting ascorbic acid in aqueous solutions, it would be non-toxic.. At present, the use of EDTA in certain drugs is officially permitted. Its use in food and vitamin preparations may also be allowed if the need is indicated. However, its innocuousness on chronic ingestion at low levels would have to be fully established before any decision is taken in this matter. Regarding the use of EDTA for protecting vitamin C in natural sources, further work is obviously needed.

In his concluding remarks, the President mentioned that in view of the fact that EDTA appeared to be quite effective in preventing the copper-catalysed oxidation of vitamin C, its use in other fields for de-activating metals with a view to preventing their deleterious effects such as rancidification of fats, the discolouration and off-flavour development in fruit juices, the loss of aroma of coffee on contact with metals etc.—deserves to be explored.

Information and Advice

In pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Preservation of tomato juice and raspberry jam

E (IS) 44

We are having certain difficulties with regard to the preservation of tomato juice and raspberry jam. Could you kindly suggest some remedy? (Bangalore).

We are giving below some suggestions which will help you in improving the quality of your products.

1. *Tomato juice*

(a) It is absolutely essential to use the variety of tomatoes which will give you acceptable quality of juice.

(b) The tomatoes must be fully ripe.

(c) No spoiled or unripe tomatoes should be used at all.

(d) Tomatoes must be thoroughly washed in clean water.

(e) They should be cored or trimmed with stainless steel knives and kept in stainless steel vessels.

(f) Before the extraction of the juice they should be heated or boiled, if necessary, in stainless steel pans.

(g) The juice should be extracted by pressing through coarse cloth or by passing through a fine mesh pulper.

(h) If the separation of pulp and serum is to be avoided it is necessary to homogenise the juice. Homogenisers are available commercially.

(i) If you preserve the juice in carboys, it is absolutely essential that they should be free from contamination.

(j) Commercial preservatives used by you should also be of high quality and free from metallic or microbial contamination.

(k) If the juice or the commercial preservative has come in contact with any metal such as copper or iron it is bound to turn dark. The same way if the water used for washing has been kept in iron or copper vessel it can darken the juice. Another factor responsible for darkening is the exposure of the carboys to light. If you have dark coloured carboys or keep them in darkness the discolouration of the juice can be avoided. If in spite of all this, if you have difficulty, we would suggest addition of 0.05 to 0.1 per cent ascorbic acid (vitamin C).

This would act as antioxidant and increase the storage life, besides improving the nutritive value of the juice.

2. *Raspberry jam*

(a) It appears from the processes described by you for making raspberry preserve that you have concentrated the product with 0.5 per cent acidity which has been responsible for breaking down the pectin. Therefore, we suggest that you may kindly make the following alterations in your process:

> Add sugar and concentrate the mixture to about 65° Brix. Then mix pectin with some more sugar and dissolve it in the batch of the raspberry preserve or jam. As soon as pectin is dissolved, you should stop heating and fill the jam or preserve in containers allowing the product to cool as soon as possible. This should give you jam of satisfactory quality.

(b) Another important point is that the acidity of a preserve does not determine its setting quality. It is essential to determine the pH representing the hydrogen ion concentration. Generally, most of the jams set quite well between pH 2.9 and 3.3. This pH is, however, likely to represent much higher acidity in jam than what you have mentioned.

(c) As indicated above in case of tomato juice, contact with metals like iron and copper should be avoided for any of the raw materials used in the preservation of jam.

Low fat groundnut flour

E (IS) 45

Kindly let me know the significance of 'blanching machine' in the process of making low fat groundnut flour. (Mangalore).

The word 'blanching' should not be mistaken for the process of blanching as applied to the fruit and vegetable industry. Here it is called as 'Peanut Blanching Machine' which helps to remove the red cuticle from the kernels. When roasted peanuts are fed through the hopper of the machine, they enter the blanching chamber, where the blanching brushes separate the cuticle without the nuts being broken or crushed. The nuts fall from the blanching chamber down a separating chute where an air blast blows the skins, dust, etc., into a filter bag fastened to the fan outlet. The nuts and germs fall into a vibrating sieve where the germs are removed and the 'blanched' (decuticled) nuts fall into any convenient receptacle. The machine can handle six cwts. of peanuts per hour.

Preservation of syrups

E (IS) 46

What are the principles of preservation of syrups? What are the permitted colours in the red shade? (Darbhanga, Bihar).

The principle of preservation of syrups is that those containing more than 65 per cent sugar can be preserved as such and those with less quantity of sugar require the addition of potassium metabisulphite in the dose of 1 oz. per 100 lb. of the syrup or sodium benzoate in a dose of 1.6 oz per 100 lbs. of the product. Either of the two are available from chemists and druggists.

The permissible colours in the red shade according to the Food Laws are:

(1) Ponceau 4 R; (2) Carmoisine; (3) Red 6B; (4) Red FB, (5) Fast Red E and (6) Acid Magenta.

Both the Bush and the Boak brand of colours are being used satisfactorily.

Baker's yeast

E (IS) 47

What is meant by yeast which is used in biscuits? (Dist. Parbhani).

Baker's yeast is the live, unicellular micro-organism which is used in the bakery industry as a biological leavening agent. It ferments the sugars present in the dough producing carbon dioxide, which helps in increasing the volume of the loaf during baking.

Concentrated foam heading

E (IS) 48

Kindly intimate us the simple or the established method through which Concentrated Foam Heading from soapnuts (Ritha) for use in the aerated water is prepared? (Patna).

Concentrated Foam Heading from soapnuts, for use in aerated water and about which you have instituted an enquiry does not fall within the purview of the research investigations undertaken at this Institute. We are therefore unable to furnish any information to you on the subject. While we are not sure which institution could furnish you the exact information on this subject, we have to suggest your kindly contacting the Deputy Development Officer (Food) in the Development Wing of the Ministry of Commerce and Industry, Government of India, Delhi.

Mother vinegar

E (M) 49

Please let me know the uses of mother vinegar. (Calcutta).

Mother vinegar is usually used to start the growth of vinegar bacteria in the vinegar generator or the fermented alcoholic solution as it carries living bacteria. It cannot be used in place of vinegar as it is not a good quality nature vinegar. For the purpose of using it for preparation of vinegar 1-2 bottles are sufficient and you can further multiply it to the required quantity. In the light of the present reply, please reconsider about your requirements and inform us accordingly so that we may despatch mother vinegar for your use.

Per-capita refrigerated space

E (S) 50

Kindly let us have details regarding the per-capita refrigerated space in other countries. (Calcutta).

The information is provided below:

(1) U.S.A.	5.9 cu. ft.
(2) U.K.	0.6 ,,
(3) Australia	12.0 ,,
(4) New Zealand	27.2 ,,
(5) India	0.025 ,,

Can sealing composition

E (F) 51

We are experiencing certain difficulties with regard to the correct method of can sealing. We shall appreciate your advice for improving the same? (Poona).

As already indicated in the report on the use of the new sealing composition for the formation of gaskets in can ends, it does not contaminate to any noticeable extent the foods packed in cans in which these treated lids are used. Apart from any question of contamination of foodstuffs packed in cans, the more important factor to be considered is the suitability of the composition for forming the gasket that would give a hermetic seal to the can and be resistant to the action of syrups, brines and spiced gravy, the last of which is used in the case of curried vegetables which are now being packed to a fairly large extent in this country. If the texture and gasket forming characteristic of the composition could be improved it should be possible to develop it into a sealing composition that could be used as a substitute for similar composition that is at present being employed for the formation of gaskets in can ends which are specially employed for packing heat-processed foodstuffs. We shall therefore, be glad to know of any improvements that might be affected in improving the gasket-forming qualities of the new sealing composition.

Preparation of fruit toffees

E (F) 52

We shall appreciate if technical details of the process of making fruit toffees are released for exploitation by the industry. (Delhi).

The method of preparation of fruit toffees is given below:

Preparation of fruit pulp: Pulp of the fruit to be used is first made. A stainless steel pulper with a 30 mesh screen may be used on a small factory scale for this purpose in the case of fruits like bananas, mangoes, jack fruit, etc. For preparation on a cottage scale, pulp may be prepared by crushing the peeled and prepared fruit and pressing it through a stainless steel or monel metal sieve.

Recipe: A general recipe is as under:

Fruit pulp	53 lb.
Sugar	30 lb.
Glucose	4 lb.
Skim milk powder	8 lb.
Hydrogenated fat (vanaspati)	5 lb.

A suitable essence and colour, if desired.

Cooking: The fruit pulp is concentrated by evaporation in a steam jacketed kettle to about a third of its original volume, the other ingredients are then mixed up and cooking continued to a final weight equal to about 1-1/5 times that of the fruit pulp taken.

Cooling and setting: The cooked mass is transferred to a smooth, hard and level surface, preferably of a table with a stainless steel top, smeared lightly with fat. The flavouring material is added at this stage, if desired, and the product spread into a thin sheet of ½-¾ cm. thickness and allowed to cool and set for two hours. The solid sheet is cut into toffees and dried at 50-55°C to a final moisture content of about 5-6 per cent, after which the toffees are wrapped as usual.

Dehydration of potatoes

E (F) 53

Please let us have details about the dehydration of potatoes on a cottage industry scale.

The method of dehydrating potatoes as practised in our experimental tunnel dehydrator is as follows:

Potatoes of large size free from disease and fully ripe with as few eyes as possible are selected. Potatoes as received from the market are thoroughly washed in running water in a cement tank to remove dirt and other extraneous matter. Peeling and tirmming operations were done by hand. Washed tubers were peeled either by means of a sharp stainless steel knife or by means of oyster shells (Slippis) with the centre of the convex side ground to sharp chisel-like edge. Both the peeling devices gave satisfactory results, but peeling with 'Slippi (was quicker than peeling with knife but entailed slightly higher losses. 'Eyes' and undesirable portions of the peeled potatoes were then removed by means of stainless steel sharp, spoonshaped knives.

Note: Peeled and trimmed potatoes were then immersed in water.

Peeled potatoes are sliced about 3/16″ thick in an ordinary 'fodder cutter' type slicer which could be adjusted to cut slices of desired thickness.

Cut slices of potatoes are immediately put in stainless steel tanks containing cold water. In some cases when the slices had to wait considerably, say 5 to 6 hours before they could be put into the dehydrator, they are placed in 0.05 per cent potassium metabisulphite solution. This prevented spoilage which is liable to occur in slices stored in brine or water during hot summer months.

The prepared slices are then put in small lots of about 15 lb. in a perforated galvanized iron bucket which is placed in boiling water in open galvanized iron tanks heated on direct fire (a coal furnace). The bucket is constantly stirred with a lever arrangement and the temperature of water is not allowed to go below 190°F. Potatoes of different lots take about 4 to 6 minutes for proper blanching. Properly blanched slices along with the bucket are then dipped in a tank containing running cold water.

Note 1: Blanching should be carried to a stage when the starch in the blanched slices is neither raw nor overcooked. This is easily ascertained by tasting the blanched slices. If the slices are under-blanched then the undercooked starch can be felt under the teeth giving a hard and gritty sensation. Overcooked slices are too soft and break even with a slight touch. Properly blanched slices for drying purposes should be just midway between the above two stages. With experience one can judge this stage by simply pressing the slices between two fingers.

Note 2: Where steam is available, blanching can also be done in a steam-jacketed kettle.

A. Tunnel Dehydrator (recirculating air blast type): A small experimental tunnel dehydrator (three trolley unit) was constructed at Lyallpur and its description briefly given below:

1. *Description:*

Drying chamber: *length of tunnel, 13 ft.; width, 5 height, 6½ ft.

Heating chamber: length, 10 ft.; width, 5 ft.; height, 3

Fan chamber: length, 2½ ft. width 5 ft.; height, 3 ft.

Hot air draft inlet slit in drying chamber at hot end dimensions: 5′ × 1′.

Hot air from the heating passes through this opening into drying chamber.

2. *Fresh air arrangement:*

Fresh air damper at the cold end —3¼′ × 1½′.

The above has an adjustable lid which can be opened or closed as desired for the working of the dehydrator.

3. *Side dampers for controlling the humidity:*

There are two dampers on both sides of the tunnel near the cold end which are fitted with adjustable metallic flaps to regulate the flow of outgoing moist air in accordance with the humidity in the drying chamber. Some of the moist air is thus thrown out and the rest is allowed to go into the fan chamber to be recirculated in the drying chamber. The dimensions of these two dampers are: 18″ × 9″.

4. *Heating system:*

Because we had a steam boiler available here in our laboratories, we have utilized that for heating purposes. There are two sets of coils heated by steam. In making these coils, 160 ft. of one inch tubing and 110 ft. of ½″ tubing have been used. These are placed in the heating chamber just in front of the blower fan.

The above system of heating the coils is no doubt clean and permits of better regulation in temperature, but its thermal efficiency is fairly low, which makes this system rather expensive as it involves high fuel consumption.

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* This is not a suitable size for commercial production. For this purpose tunnel length should at least be 26 ft.

Coal furnaces have also been installed on top of the drying chamber from which flues have been taken through the chamber on to its top. These flues which are connected to chimney are heated by the products of combustion of coal which pass out through the chimney. This system has also been found to be very efficient and is much less expensive than the steam heating. For commercial manufacturers coal furnace system will be more suitable as it dispenses with the installation of a boiler.

5. *Air-flow system:*

One multivein type fan 20″ in diameter with 12 blades or veins is placed in the fan chamber which blows air directly on to the coils placed in the heating chamber on top of the drying chamber. For 13 ft. tunnel, the speed of air flow in the chamber works out to be about 200 linear ft. per minute as against 500-600 ft. in normal commercial tunnels of larger size, say 25 to 30 ft.

Note: While running the dehydrator continuously, the space around the first trolley near the hot end where the heated air is entering the drying chamber should be totally closed to stop the passage of air through the empty spaces. This has been done in the present case by means of thick canvas flaps.

6. *Trays and trollies:*

Dimensions of trays: Area of $\frac{1}{8}''$ mesh galvanised iron sieve fixed in deodar wooden frame—$2\frac{1}{4}' \times 2'$. Dimensions of trollies: length, $2\frac{1}{2}$ ft.; width, 4′-8″; height 5′-8″.

There are four trolleys of the above dimensions. Each trolley accommodates 40 trays in two rows. Space between each tray is 2″. The tunnel is worked as a three trolley unit.

7. *Trolley track and turn tables:*

The triangular track (about 100 ft. long, 2 ft. 4″ wide) has been built with three turn tables at three corners of the track which enable the transferring of loaded trolleys into the drying tunnel.

B. Running of the dehydrator: The prepared slices under item (5) above were put in single layers on wire guage (18″ mesh) trays. One square foot of tray surface contained about 1 to $1\frac{1}{4}$ lb. of slices. The trays were then loaded in a trolley which was rolled into the drying tunnel at its 'cold' or 'entrance' end. The dehydrator, the temperature of which was 140-145°F, at the cold end and about 170-180°F, at the hot end, was then closed air-tight. After about two and half hours, second loaded trolley was rolled in and the tunnel closed air-tight. This process was repeated for the third trolley. After a lapse of about $2\frac{1}{2}$ hours after the third trolley had gone in, the first trolley (i.e. which was put in the dehydrator in the beginning) was taken out at the 'hot' end with dried potato slices and another trolley freshly loaded was pushed in through the 'cold' end. In this way the process became a continuous one. Thus after every two and half hours one trolley with dried potatoes was taken out at the hot end and a freshly loaded trolley was rolled in at the cold end.

During the process of drying, the temperature and humidity were controlled by the aid of side-dampers and the fresh air damper as follows:

Temperature

Cold end (damper end): 140-145°F
Hot end (draft end): 160-165°F

Relative Humidity

Cold end: 40-45%
Hot end: 20-25%

Note: The temperature and humidity regulations: The temperature of wet bulb and dry bulb thermometers on both ends should be read at intervals of 30 minutes and the humidity per cent calculated at once to enable the observer to know the actual condition inside.

Thus in 24 hours, after the 1st trolley with dried potatoes is taken out, 9 to 10 trolley loads of fresh potatoes could be dried.

Note: (1) Drying time for each trolley varied from 7 to 8 hours. (2) Capacity of this dehydrator is about 4 mds. of dried potatoes per 24 working hours, after the process has become continuous.

INDIAN FOOD LAWS (*published in August 1954*) pp. v + 220.

This volume summarizes all important details regarding the history, operation and enforcement of the food laws existing in different States in India, definitions, descriptions and chemical standards for articles of food including permissible additives (colours, flavours and preservatives) and labelling of foodstuffs. The large number of tables on the comparative chemical standards prescribed for different food commodities in various parts of the country make the book useful for reference and guidance for the public analysts and the legal profession.

Price: Indian, Rs. 4.50 (*postage extra*); Foreign, 10 shillings; $ 1.75

Notes and News

STATISTICAL NOTES

All-India Final Estimates of Rice, Bajra Maize, Ragi and Kharif Pulses, 1957–1958

Crop	Area (thousand acres)		Production (thousand tons)	
	1957-58 (Final estimates)	1956-57 (Partially revised estimates)	1957-58 (Final estimates)	1956-57 (Partially revised estimates)
Rice	79,027	79,320	24,821	28,282
Bajra	27,453	27,884	3,565	2,885
Maize	9,762	9,197	3,064	3,009
Ragi	5,897	5,831	1,716	1,715
Kharif pulses				
Urd or Mash ...	2,323	3,236	221	258
Mung	3,009	2,861	247	282
Moth	4,142	4,675	286	369
Kulthi	3,155	3,229	273	289
Peas	14	14	2	2
Other pulses ...	3,189	3,469	372	315
Total pulses ...	15,832	17,484	1,401	1,515

(*Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India*)

NEWS BRIEFS

Better apple storage: Experiments in New South Wales and Queensland have shown that a treatment of diphenylamine is superior to the present gas chamber technique in preserving apples in cold stores. These experiments confirm overseas observations that scald, a typical cold storage disorder of apples, is not likely to occur with this technique. However, little is known of the toxicology of diphenylamine and Health Departments in a number of countries are now taking an interest in the health aspects of this process which appears to represent a distinct technological advance in apple storage. (*Food Technol. Austr.*, March 1958, p. 149).

Fortified dried milk: A method of producing a vitamin A fortified non-fat dried milk with good vitamin A stability is described. Synthetic vitamin A acetate in solution in peanut oil is dissolved in fully hydrogenated coconut oil to which tocopherols and lecithin are added. This is then homogenized into pasteurized skim milk and added to skim milk concentrate before spray drying. The process is at present batchwise, but is being adapted to continuous operation. (*Food Technol. Austr.*, March 1958, p. 163).

The use of synthetic carotene for colouring butter: Synthetic beta-carotene was compared with coal-tar dyes as a colouring agent for butter. With a view to duplicating commercial conditions, the comparison was made at two levels of cream quality, two levels of copper, and at three periods of storage. Neither official graders nor a taste panel could detect any flavour difference between the two types of butter. Acid degree, peroxide, and aldehyde values were the same for both types of butter, although copper and storage increased the degree of oxidation. Standardizing the colour of bu with 0.35 g. of synthetic be carotene per 100 lb. of fat g slightly deeper colour than w 1 oz. of coal-tar colour per 100 of fat. The colour intensity of t butter did not change duri storage. The average vitamin potency of the butter was incre to 3800 I.U. per lb. as a result colouring the butter with synthet beta-carotene, and was not affect by storage. (*Food Technol. A* March 1958, p. 163).

Chemical changes in mil processing: Some aspects o processing on the reducing capacit of milk protein as measured b reduction of acid ferri-cyanide we studied. All stages of processin resulted in higher reducing values With milk concentrates the reducin capacity increased with temperature of heating and concentration of milk solids. The possibility of the protein-sugar reaction occurring during manufacture and its significance with regard to the properties of the final product are discussed. (*Food Technol. Austr.*, March 1958, p. 164).

A comparative study of chemical preservatives in fresh apple juice: The relative merits of sorbic acid, sodium sorbate and sodium benzoate, in concentrations of 0.035, 0.05 and 0.1 per cent respectively, as chemical preservatives in fresh, unpasteurized appl juice were studied. The basic juice tested 0.83 per cent acid (as malic) and was fortified with ascorbic acid to retard spoilage by acetic acid bacteria. Analyses were made initially and at 5, 10, 15, 21, and 2 days.

Active fermentation occurred in control juices in less than 48 hours and in the sodium sorbate treate juice in 15 to 21 days. No fermentation took place in juices containing sorbic acid or sodiur benzoate during the 28-day test period. These observations w substantiated by plate count results.

Sorbic acid and sodium benzo increased slightly the titrable acid of the apple juice but pH and soluble solids readings remained constant in all non-fermenting samples.

Organoleptically the juice containing sodium sorbate was superior to the others tested for 15 days or until fermentation began. Sorbic acid caused a slight accentuation to the already high acidity of the initial juice but sodium benzoate imparted a sharp burning flavour which made the product *undesirable* to all members of the taste panel. (*Food Technol. Austr.*, March 1958, p. 164).

Vacuum dehydration of prawns: By means of this process the equivalent of seven pounds of fresh prawns can be packed in a can weighing 13-1/4 oz. net, and the prawns can be easily reconstituted by mixing with water. This results in a substantial saving in shipping costs and the easing of storage problems. The process, invented by Dr Henry Wager, is being successfully utilized by Liana Inc., Harlingen, Texas. (*Food Technol. Austr.*, March 1958, p. 167).

New refining method: Most of the conventional refining methods for vegetable and animal oils entail fairly considerable losses of oil, especially in the neutralization stage. More modern methods, based on continuous processing and designed to reduce the neutralisation losses, are usually rather complicated and call for costly apparatus and specialised personnel. Also, they are often not flexible enough to permit of frequent variations in the quality of the crude oil to be treated. A new process, developed by G. and S. Vaccarino, is based on the use of acetone as a dissolving agent. Unlike other agents used for this purpose, acetone is inexpensive and recoverable; it dissolves perfectly in oils and water, and also has the advantage that it can serve, at the same time, as a de-gumming agent. A Vaccarino plant for intermittent operation is already working in Italy. (*Food Manuf.*, January 1958, p. 35).

Uses of ascorbic acid: The meat industry is becoming increasingly interested in the use of ascorbic acid (vitamin C) for the treatment of fresh meat, cured meat and the cut surfaces of meat products. Experiments carried out at the Institute for Food Hygiene of the Free University, Berlin, showed that an addition of a 1:2000 concentration of ascorbic acid permitted a reduction of the quantity of nitrate curing salt to two-fifths, without prejudice to the reddening and colour-keeping effect. In the case of dry sausages, 60 per cent of the vitamin C admixture can still be detected five weeks after manufacture. But vitamin C is not able to arrest or 'camouflage' the ageing or decomposition of the products. (*Food Manuf.*, January 1958, p. 35).

Glucose oxidase as a stabiliser: Deterioration and spoilage of beer caused by oxidation are shown to be reduced by the addition of minute quantities of a glucose oxidase preparation to the beer after fermentation.

In the enzyme system, the glucose oxidase catalyses the oxidation of glucose to gluconic acid and hydrogen peroxide. Catalase present in the glucose oxidase preparation then breaks down the hydrogen peroxide to water and oxygen. The net result of the reaction is that free oxygen is removed from the beer.

The glucose oxidase used in the experiments was a commercial product, available in both powder and liquid form. The amount needed to stabilise beers was only 1 ml. or $\frac{1}{2}$ gm. per barrel of beer.

In pasteurised beer it was found that glucose oxidase inhibited the oxidation reaction and decreased the iron pick-up from the can. In draught beer the results showed that yeast spoilage was retarded. (*Food Manuf.*, January 1958, p. 35).

Cartons for apple storage: Vented cartons with perforated trays allow apples to cool in half the time required for unventilated containers, and perform equally with standard wooden boxes.

Most satisfactory vent sizes are $\frac{3}{4} \times 2$ in., with two in each end of carton (one at upper, one at lower level). In addition, stacking must allow surface exposure equal to area of 2 ends, with vents in these surfaces. (*Food Engg.*, December 1957, p. 103).

Puff drying of whole milk improves dispersibility: A dried whole milk of excellent fresh flavour and rapid dispersibility in cold water has been made in a vacuum shelf dryer, using special foam-drying techniques.

In its preparation, fresh pasteurized, homogenized milk is concentrated to 47-50 per cent total solids at a temperature of 85-100°F, in a high vacuum, falling-film evaporator. Concentrate is heated to 135°F. and nitrogen bubbled through it from a sparge line to disperse the entrained gas. This is followed immediately by 2-stage homogenization, at 4,000 p.s.i. and 500 p.s.i. respectively.

Concentrate is then flowed over stainless steel drying pans to an average depth of 1/16th in., chilled to 55°F or below, and dried as a foam in a vacuum shelf dryer. Dried mass is crushed lightly through stainless screens.

Tests indicate that product passed through a 20-mesh screen has greater dispersibility than that put through a 40-mesh. There was little difference between material that had expanded from 32- to 72-fold during drying, but expansion below 32 reduced dispersibility considerably. (*Food Engg.*, December 1957, p. 103).

Quick tests for protein: Two fast, reliable, inexpensive methods for measuring protein in food products have been developed by USDA scientists.

One method is based on the reaction of protein with copper ions to form a violet Cu salt. In practice, freshly ground wheat or flour samples are treated with the reagent—consisting of alkali, Cu, and glycerine. Intensity of violet colour produced is read in a colorimeter, and the readings converted to protein values by special charts.

Second method is based on a reaction of orange G dye and proteins which forms an insoluble protein complex. In practice, a known amount of dye is added to the protein-containing sample and the mixture agitated to complete reaction.

Insoluble complex is separated by centrifuging and concentration of unbound dye in supernatant solution is determined colorimetrically. Protein content of sample can be read directly from special table.

Latter method takes about 5 min., and has been used effectively on wheat and barley products, and on dry and whole milk. (*Food Engg.*, December 1957, p. 106).

Milk protein concentrate: A new type protein concentrate with a body resembling yogurt is prepared by mixing separated milk with finely flocculated casein.

The casein is obtained by precipitation with lactic or citric acids, or biologically, using a cream or acidophilus starter culture. Method of its preparation influences flavour of the protein concentrate. When cream culture is used, product has a mild sour taste, when acidophilus culture is used the flavour is sharp and sour.

The product contains 21.8 per cent solids, 13.8 per cent protein, 5.6 per cent lactose, 1.5 per cent butterfat and 0.9 per cent ash. At 40°F it keeps well for 5-6 days.

Product is consumed as such or used in preparation of various foods such as spreads flavoured with chives, garlic, carraway, paprika, etc., or as creames and fillings with added fruit, compotes, jams or fruit juices. (*Food Engg.*, February 1958, p. 126).

Detecting rancidity in butter: The possibility of applying spectral analysis to determine the rancidity of butter was recently investigated in Russia, using a quartz spectrophotometer.

Butter was first rendered at 177°F. Then resulting butterfat was boiled with water and 25 ml. of distillate examined for transmittance at 280 mμ. Thickness of distillate layer was 10 mm. Value obtained was compared with that of distilled water which was considered 100 per cent.

The method was tested on butterfat stored for 6 months at room temperature. Chemical and organoleptic tests were conducted simultaneously. Initial value for fresh butterfat was 84 per cent. From the 4th month, transmittance decreased, reaching 32 per cent at 5½ months when definite symptoms of rancidity were noticed.

On the basis of these results, the author set up the following scale: (1) Transmittance at 280 mμ of more than 80 per cent, high quality fat having good keeping quality, (2) Transmittance of 40-79 per cent, good quality fat, but unsuitable for prolonged storage, and (3) Transmittance below 40 per cent, rancid and unsuitable for human consumption. (*Food Engg.*, February 1958, p. 133).

Fortification of milled rice: The U.S. Food and Drug Administration has established a standard of enrichment for milled rice. The standard, designed to improve the nutritional value of a basic food, specifies the vitamins and amounts to be added to milled rice where a rice packer chooses to market an enriched product.

The FDA standard would assure the consumer that rice labelled 'enriched' has specified amounts of thiamine, riboflavin, niacin, and iron that are used in other enriched cereal products, as recommended by nutritionists. Also, it would enable the housewife to avoid loss of these vitamins in cooking, the agency said.

The new standard allows two enrichment processes. One process makes the product resistant to loss of vitamins when it is rinsed before cooking. In such rice a proportion of the kernels have a golden yellow colour due to the riboflavin content. The standard would require packers to test this product to make sure that the loss during rinsing is kept to a specified minimum.

In the second enrichment proc all the rice is coated with the riching ingredients. This rice not changed appreciably in Its label would caution the not to rinse before or drain cooking.

Under the standard, each pou of milled rice that is labelle 'enriched' must contain 2.0 to 4 mg. of thiamine, 1.2 to 2.4 mg. riboflavin, 16 to 32 mg. of niaci and 13 to 26 mg. of iron. The co of these enrichment ingredien would be about five cents per 10 pounds of rice.

The rice packer may, in additio enrich his product with vitamin D or calcium, or both. If he choose to do so, each pound of his produc must contain 250 to 1,000 U.S.P. units of vitamin D or 500 to 1,000 mg. of calcium. (*Food*, February 1958, p. 49).

Synthetic chocolate: A new process for producing a versatile synthetic chocolate that simulates the aroma, flavour, feel, colour and nutritional values of the natural product has been invented by Dr Simon L. Ruskin, a New York physician and chemist. The invention, for which 14 claims are made, has been granted U.S. Patent No. 2,816,834.

The synthetic chocolate, according to the inventor, can be eaten by persons allergic to cocoa beans, the source of natural chocolate. Moreover, it is claimed that substances can be added to the synthetic product that will relieve seasickness and also airsickness, and fatigue, making it useful for aviators.

It has also been discovered that material produced according to the invention has bacteriostatic properties and when admixed with milk will keep the milk sweet for as long as six weeks.

The synthetic chocolate is produced by a number of formulae that include a furfuryl compound, a sugar, and a protein. Oat hulls are the natural source of furfuryl, although it also can be made synthetically. According to the new patent, it is also possible to produce synthetic coffee and maple syrup. (*Food*, February 1958, p. 57).

NEW INDIAN STANDARDS

Natural sour casein: Casein glue is one of the commonest adhesives used in the country for bonding plywood, fibre boards, etc. Casein for making the glue is produced indigenously as a dairy product and is also imported. The Indian Standard Specification for Natural Sour (Lactic) Casein for Glue Manufacture (IS: 850-1957) specifies the material, colour, odour and fineness of casein. Requirement and tests for moisture content, fat content, ash content, acidity, chloride and sulphate contents are also specified. It is hoped that the standard would provide the necessary guidance to the casein industry, which in India is organized on a cottage industry basis. (*ISI Bull.*, March 1958, p. 94).

Synthetic resin adhesives: Adhesives form one of the most important raw materials used in the plywood industry and wood work and joinery industry. The selection of the adhesive and its correct use are important factors controlling the quality of the plywood or the joinery work produced. The raw materials for adhesives are not all found in this country; a large, quantity of raw materials and synthetic resin adhesives is imported. In the context of this background of the industry, it has been found necessary to lay down the Indian Standard Specification for Synthetic Resin Adhesives for Plywood (Phenolic and Amino plastic) (IS: 848-1957) governing the quality of the raw materials and the performance expected from the prepared glues, such standards, it is believed, would guide further development of the adhesives industry on sound lines and lead to the achievement of self-sufficiency in regard to the country's requirements.

This Indian Standard covers phenolic and amino plastic synthetic resin adhesives largely used in the plywood industry for gluing veneers. It defines types of adhesives and the requirements for each type, and also specifies the keeping qualities required of these adhesives.

This standard forms one of a series of Indian Standards on glue adhesives. Other standards in this series are:

(1) IS: 849-1957 Cold setting casein glue for wood.

(2) IS: 850-1957 Natural sour (lactic) casein for glue manufacture.

(3) IS: 851-1957 Synthetic resin adhesives for construction work in wood.

(4) IS: 852-1957 Animal glue. (*ISI Bull.*, March 1958, p. 94).

Bleaching earths: Large quantities of different types of bleaching earths are being used in the country for decolourizing vegetable oils. There are, however, no uniform methods of sampling and test for these bleaching earths, nor has a standard yet been formulated by any country on this subject. With a view to introducing uniform methods of sampling and test for these materials, the Indian Standard Methods of sampling and test for bleaching earths used for decolourizing vegetable oils (IS: 1035-1957) have been formulated.

This standard covers methods for determining moisture, bulk density, screen analysis and acidity or alkalinity. Tentative methods for determining decolourizing power, filtrability and oil retention have also been prescribed. It is expected that other methods to replace the tentative methods will be evolved as a result of further collaborative work, experience and committee investigations. Till such time as this is done, it was felt that, subject to agreement between the purchaser and the vendor, the purchaser should have the option to test the material for these characteristics by performance tests. (*ISI Bull.*, March 1958, p. 96).

PATENTS

Indian

59908. *Improved process for the manufacture of absolute alcohol by distillation of fermented liquids:* Wherein the stripping and rectifying columns are worked at higher pressure and alcohol vapours from the rectifying column are used as source of heat for dehydration and benzene recovery columns.—Patented by Venkiteswaran. (*Res. & Ind.*, February 1958, p. 49).

58379. *Improvements in a method of producing vitamin A: β*-ionone is condensed with cyanoacetic acid, the product is decarboxylated and the acetonitrile is converted into an aldimine complex which is hydrolysed to β-ionylidene acetaldehyde the aldehyde being condensed with acetone and resulting C_{18}-Ketone being subjected to the same steps as before to obtain vitamin A aldehyde which is reduced to obtain vitamin A.—Patented by N. V. Philips Gloeilampenfabrieken. (*Res. & Ind.*, February 1958, p. 49).

61080. *Process for the purification of lactic acid:* Lactic acid in the presence of at least 0.01 per cent of a non-volatile organic or inorganic acid is subjected to steam distillation.—Patented by Aktieselskabet De Danske Sukkerfabrikker (*Res. & Ind.*, February 1958, p. 50).

59455. *Process for the preparation of a protein hydrolysate for oral use:* Subjecting proteins from mustard and sesame cakes to the action of papain—Patented by Council of Scientific and Industrial Research. (*Res. & Ind.*, February 1958, p. 50).

57890. *Novel insecticidal compositions:* DDT and compound of formula $Cl\text{-}C_6H_4\text{-}SO_2N(R)_2$ where R is n-alkyl radical with 3-7 C-atoms.—Patented by Hamadait and Neeman. (*Res. & Ind.*, February 1958, p. 50).

56883. *Process for the manufacture of panels, plates and shaped pieces from natural rice husk, and particularly from chemically and biologically treated rice husk:* Wherein a paste made from rice chaff or husk and self-hardening binders based on urea and/or formaldehyde and/or phenol and/or cement and substances containing magnesia, is cast into moulds.—Patented by Caffi. (*Res. & Ind.*, February 1958, p. 51).

Foreign

781,620. *Producing frozen fish:* A method is described for the production of frozen fish pieces of uniform weight and size. Pieces of fresh fish are placed in a pressing from in which they are held tightly confined in walls extending parallel to the main direction of the fibres. In the form they are subjected to a pressure of at least 0.5 kg./cm² above atmospheric pressure, sufficient to cause reshaping of the pieces even in the plane at right angles to the pressure direction and in the direction of the fibres, making them fill the cross-sectional shape of the form. The pressed block thus produced is thereupon frozen and finally divided along planes at right angles to the direction of pressing.

The pieces may be coated with an agent which will aid in their cohesion. It has been found that a solution of actomyosin, the fibrous protein dissolved from the fish muscle with the aid of a suitable salt solution, forms the ideal agent for this purpose.

A machine for carrying out this process has an upper and lower piston which can be moved up and down while fitting tightly within the walls of the form. The lower piston is lowered after each pressing operation by a distance corresponding to the height of a pressed portion, the upper piston is pressed against the material and withdrawn again, leaving a space into which more fish may be inserted for pressing. This avoids the need for inserting fish pieces to an exact depth.—Patented by Norsk Frossenfish A/L. (*Food Manuf.*, January 1958, p. 44).

783,194. *Preserving fruit:* Relates to an aqueous dispersion of diphenyl for application to paper and other materials used in packing and preserving fruit, especially citrus fruit such as oranges, grape fruit and lemons, comprising finely divided diphenyl in an aqueous medium of viscosity sufficient to maintain the diphenyl in dispersion, e.g., an aqueous medium having a water soluble salt of a polymeric material containing carbonyl groups. —Patented by Monsanto Chemical, Ltd. (*Food Trade Rev.*, December 1957, p. 44).

784,865. *Rice:* Relates to a process of preparing quick cooking rice: Ungelatinised rice grains are soaked in water below their gelatinisation temperature to increase their moisture content and the soaked grains steamed to effect gelatinisation and thereafter subjected to mechanical compression to distort and modify the structure of the rice grains without reducing them to a flaked condition. —Patented by A. K. Ozai—Durrani. (*Food Trade Rev.*, December 1957, p. 44).

784,831 and **784,832.** *Fermented goods:* Relate to processes for the production of bread and other fermented goods utilizing the action of proteolytic enzymes of the papain class and more particularly to means for reducing or decelerating the action of the enzymes by incorporating into the substance the germs and/or the husks separated from raw leguminous seeds such as soya beans, haricot beans or peas.—Patented by British Soya Prod Ltd. (*Food Trade Rev.*, Decem 1957, p. 44).

784,905. *Fish:* Relates to process of deodorising and/or d flavouring proteinaceous ma particularly fish such as cod, whiti and haddock, which compris subjecting the material to extracti with alcohol at an alkaline pH o between 8 and 12 and in the presence of a reducing agent.—Patented by Unilever, Ltd. (*Food Trad Rev.*, December 1957, p. 44).

2,783,150. *Quality of dough improved with glucose oxidase* (U.S February 26, 1957): Improved dough formations may be achieved by the addition of a minor proportion of the enzyme glucose oxidase. This enzyme expedites changes that are normally accomplished by aging the flour for some months. Other materials such as ascorbic acid, nitrogen chloride, chlorine dioxide, bromates, and benzoyl peroxide may be added, the first being particularly effective. In general, one part by weight of the enzyme is used per 500,000 parts of flour or baking composition. Blending should be thorough. Dough from the treated flour has increased strength and better handling qualities than dough from untreated flour, and the baked products have improved texture and appearance. (*Food Engg.*, February 1958, p. 130).

C.F.T.R.I. NEWS

Mr Albert Mirles, Chemical Engineer, Department of Economic Affairs, Government of France visited the Institute during May 1958. (Also addressed the Seminar on 'Development of Industrial Research in Latin America').

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

GERMAN

ZUCKER-UND SUSSWAREN WIRTSCHAFT

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BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products.

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

The effect of a supplementary multipurpose food on the growth and nutritional status of school children, by Subrahmanyan, V., *et al.*, *Brit. J. Nutr.*, 1957, **11**, 382.—A feeding experiment extending over a period of 5 months was carried out on forty-six girls aged 4-12 years in an orphanage in Mysore to assess the value of supplementing their poor vegetarian diet with 2 oz. daily of a multipurpose food composed of groundnut flour and Bengal-gram flour, fortified with certain vitamins and calcium phosphate. The children were paired according to initial height and weight and the members of each pair allotted at random to the control and experimental groups. Values for weight, height, nutritional status, haemoglobin level and red-cell count were obtained at the beginning and end of the experiment, for subjects in the control and experimental groups. There was a significant increase in height, weight, red-cell count and haemoglobin levels of the subjects receiving the supplement. Eighteen children in the experimental group improved in nutritional status, whereas none in the control group showed improvement. On the other hand, thirteen children in the control group showed deterioration whereas none in the experimental group showed any.

The metabolism of nitrogen, calcium and phosphorus in undernourished children—3. The effect of a supplementary multipurpose food on the metabolism of nitrogen, calcium and phosphorus, by Kantha Joseph, *et al.*, *Brit. J. Nutr.*, 1957, **11**, 388.—The metabolism of nitrogen, calcium and phosphorus was studied during 5 days in five pairs of girls aged 8-11 years, similar in age, height and weight and fed on an inadequate poor vegetarian diet based on rice or on the same diet supplemented daily with 2 oz. of a multipurpose food (MPF) composed of groundnut flour and Bengalgram flour fortified with certain vitamins and calcium phosphate. The mean daily N intakes on the rice diet and on the rice—MPF diet were 2.96 and 6.09 g respectively. All the children in the two groups maintained positive N balance. The daily retention of N on the rice-MPF diet (0.96 g) was significantly higher ($P < 0.05$) than that on the rice diet (0.45 g). The mean daily intakes of Ca on the rice diet and on the rice-MPF diet were 287 and 565 mg. respecrively. All the children on the two diets were in positive Ca balance. The mean daily retentions of Ca on the rice diet and on the rice-MPF diet were 53 and 194 mg. respectively, the difference being significant at the 5 per cent level. The mean daily intakes of P on the rice diet and on the rice-MPF diet were 421 and 796 mg. respectively. All the children on the two diets were in positive P balance. The mean daily P retentions on the rice and on the rice-MPF diets were 76 and 164 mg. respectively, the difference being statistically significant ($P < 0.05$).

The stability of lycopene I. Degradation by oxygen, by Cole, E. R. and Kapur, N.S., *J. Sci. Fd. Agric.*, 1957, **8** (6), 360.—The rate of degradation by oxygen of lycopene in solution varies according to temperature. Catalytic effects of tracts of copper lead to a marked increase in rate of oxidation of solutions. Solid lycopene is degraded into small fragments and derivatives of acetone, methylheptenone, laevulinic aldehyde, laevulinic acid and of an α-dicarbonyl, probably glyoxal, have been obtained.

The stability of lycopene II. Oxidation during heating of tomato pulps, by Cole, E. R. and Kapur, N. S., *J. Sci. Fd. Agric.*, 1957, **8** (6), 366.—Degradation of lycopene occurs during the heating of serum-free tomato pulps in the presence of oxygen. The rate of breakdown as measured by colour loss varies according to availability of oxygen, temperature and intensity of illumination. Acetone and methylheptenone appear as volatile degradation products.

PART II (Indian)

ANALYTICAL

Colorimetric analysis of protein bodies, by Dutta, S. K., *Indian J. med. Res.*, 1958, **46** (2), 299.—The ability of protein bodies to bind bromophenol blue was used to develop a simple method for evaluating protein components in various preparations. Native protein and higher peptides were analysed by using bromophenol blue with calcium chloride in presence of other protein degraded bodies as well as other macro-molecular bodies, such as polyscaccharide and polynucleotide. The lower peptides might be analysed again with mercuric chloride. A combination of the two methods would estimate the protein or larger peptides content as well as its lower peptide contents separately. Each protein component has its characteristic binding capacity for the dye and as such this colorimetric method is suitable to find out the degree of homogeneity of a protein preparation.

BIOCHEMISTRY AND NUTRITION

Biosynthesis of serine from glycine, by Nadkarni, G. B. and Sreenivasan, A., *Proc. Indian Aca. Sci.*, 1958, **47** (3), 131.—Various formate precursors studied, aid in the conversion of glycine to serine *in vitro* by rat liver enzymes to different degrees. The participation of *Leuconostoc citrovorum* factor in the system has been demonstrated from *in vitro* studies on glycine conversion to serine anaerobically and in the absence of added formate or its precursors. In a dietary deficiency of niacin, there is impairment in the activity of the glycine to serine synthesizing enzyme.

Intracellular distribution in the rat liver of certain enzyme systems of serine metabolism, by Nadkarni, G. B. and Sreenivasan, A., *Proc. Indian Aca. Sci.*, 1958, **47** (4), 189.—The activities of the enzyme systems for serine decarboxylation, ethanolamine to serine conversion, serine synthesis from glycine and serine deamination, have been followed with cell fractions obtained by differential centrifugation. Serine decarboxylation, ethanolamine to serine conversion and glycine to serine conversion are associated largely with the mitochondria, while serine deamination is maximum in the nuclear fraction.

Studies on the comparative utilization of glucose, fructose and galactose in alloxan-diabetes, by Banerjee, S. and Divakaran, E. R., *Indian J. med. Res.*, 1958, **46** (2), 269.—The comparative utilization of three monosaccharides viz., glucose, fructose and galactose, administered intravenously was studied in normal and alloxan-diabetic rabbits. Blood samples obtained before and at intervals after administration of these sugars were analysed the total sugar, inorganic phosphate fructose or a galactose. True blood glucose values were calculated by subtracting the glucose equivalent of fructose or galactose from the total sugar. Samples of 24-hour urine collected after the administration of different sugars were analysed for individual sugars in the case of normal rabbits and for total sugar as well in the case of diabetic animals. The 24-hour urinary output of glucose as well as fructose or galactose was also estimated after administration of the different sugars in non-tasted diabetic rabbits. The effect of dihydroergotamine on blood glucose was also studied by injecting 0.4 mg. of the substance into normal and diabetic rabbits prior to administration of fructose. Diabetic animals removed fructose and galactose from the blood as readily as normal animals. The amounts of these sugars eliminated in the urine were not significantly different in the two groups. Obviously the initial stages of the metabolism of these sugars proceed normally in diabetes and that insulin does not mediate the actions of fructonkinase and galactokinase. However, administration of fructose and galactose was accompanied by elevations of blood glucose, which were of considerable magnitude in diabetic animals. Commensurate with this increase in blood glucose and the severity of diabetes, there was enhanced glucosuria. Injection of dihydroergotamine partly suppressed the elevation of blood glucose after fructose in normal rabbits, but not in diabetic ones. The rise in blood glucose occurring after administration of fructose and galactose might be due to conversion of these sugars into glucose probably by the liver. The abnormal increase seen in diabetic animals might be either due to their inability to utilize the glucose so formed or due to enhanced rate of conversion. When the over-all utilization of fructose and galactose by diabetic animals was assessed, they appeared to be assimilated only slightly better than glucose. Hence, the super rity of these sugars over glucose metabolic fuels in diabetes does r seem to be much.

The theory of the endogeno nitrogen metabolism in mar mals, by Basak, M. N., *Indian med. Res.*, 1958, **46** (2), 307 Urinary elimination of total nit gen, sulphur and phosphorus of human adults of different ages a body-weights and maintained adequate quantity of nitroge sulphur-phosphorus-free diets we determined. Significant positi correlation was found betwe nitrogen and sulphur and betwe nitrogen and phosphorus in endo genous urine. The average val of N:S and N:P ratios was calcula ed as 7.5 ± 0.20 and 7.2 ± 0.4 respectively. The difference between the N:S ratio of endogenou urine and of fasting urine (an tissue-proteins) and the reconciliation of the former with the N:S ratio of non-protein tissue constituents showed that the endogenous nitrogen metabolism did not represent the disintegration of tissue proteins but it was associated with and originated from the catabolism of non-protein nitrogenous tissue constituents. Similarly, the N:P ratio in endogenous urine of NP-free-fed human adults, under metabolic conditions giving no indication of demineralization of osseous tissues, suggested that the endogenous metabolism of phosphorus represented the catabolism not of tissue proteins but of certain non-protein nitrogenous tissue constituents, which were relatively richer in phosphorus than tissue proteins. The endogenous nitrogen metabolism seemed to be interrelated to the endogenous metabolism of sulphur and phosphorus such that the cellular catabolism of 7 atoms of nitrogen of non-protein tissue constituents was concomitant to the cellular catabolism of 1 atom of phosphorus from the same source. An exponential equation was developed to incorporate the relation between the size of the non-protein nitrogen store in the body and the rate of urinary nitrogen loss uring the course of continued itrogen-free feeding. It was estimated that the non-protein nitrogen tore represented about 6 per cent f the total nitrogen store in human dults on normal feeding.

Effect of protein supplementation and some so-called galactogogues' on lactation of poor Indian women, by Gopalan, C., *Indian J. med. Res.*, 1958, **46** (2), 317.—The effects of protein supplementation and of some so-called galactogogues on lactation in women of poor socio-economic group were investigated. In women subsisting on 60 g. of protein daily and having an output of breast milk of the order of about 13 oz. to 20 oz. daily, protein supplementation had no beneficial effect as far as lactation was concerned. The significance of this observation has been discussed. None of the so-called galactogogues investigated was found to have a significant effect on lactation, under the conditions obtaining in the investigation.

Nitrogen balance studies in poor Indian women during lactation, by Narasinga Rao, B. S., *et al., Indian J. med. Res.*, 1958, **46** (2), 325.—Nitrogen balance study was carried out at three levels of protein intake on six Indian women belonging to poor socio-economic group during lactation. These subjects were in the neighbourhood of N balance on an intake of 61 g. protein per day. By increasing the daily protein intake to 99 g., considerable positive nitrogen was induced in all the subjects. Further raising the intake to 114 g., had little additional effect. Based on this data it would appear that minimum protein required for nitrogen balance in lactating woman is about 1.5 g. per kg. per day. Considering the protein requirement as that which results in maximal nitrogen retention, malnourished lactating women studied here require 100 g. or above of protein per day derived from the type of diets employed in the present investigation.

The effect of vegetable protein diets on the regeneration of haemoglobin and plasma proteins in protein-depleted rats, by Phansalkar, S. V., *et al., Indian J. med. Res.*, 1958, **46** (2), 333.—The effect of depleting body stores of proteins on blood and plasma volumes, haemoglobin and plasma proteins was studied in adult albino rats on protein-free diets. The capacity of two vegetable protein mixtures—(a) bajra, red gram and amaranth, and (b) wheat, red gram and amaranth to regenerate blood proteins was determined in protein-depleted albino rats over a period of 3 weeks using skim milk protein as control. On protein-free diets, rats lost body weight continuously till the eighth week after which the fall in body weight was inconsiderable. On the other hand, blood and plasma volumes did not appreciably alter in the first four weeks of depletion, but were considerably reduced in the subsequent four-week period. The reduction in the total circulating haemoglobin and plasma protein was 56 per cent and 48 per cent respectively after eight weeks on the protein-free diet. During repletion at 10 per cent protein intake level, blood proteins tended to return to normal on all the three diets. The rate of regeneration in animals on the vegetable protein diets, however, was lower than on skim milk diet. The rate of gain in body weight was almost the same on the three diets. The animals did not regain their initial weight within three weeks of repletion, although the values of total circulating haemoglobin and plasma proteins were restored to normal. These results suggest that the regeneration of blood proteins took priority over the restoration of body weight. The results indicate that suitable vegetable protein combinations could be used for the prevention and treatment of protein malnutrition and the anaemia associated with it.

The analytical behaviour of tryptophan peptides, by Ram, M., Ingle, T. R. and Damodaran, M., *J. sci. industr. Res.*, 1958, **17C** (2), 21.—The application of the colorimetric glyoxylic acid method of Shaw and McFarlane and of microbiological assays with *Lactobacillus arabinosus* and *Streptococcus faecalis* to the determination of tryptophan in di- and tri-peptides containing tryptophan was investigated. It was found that the values obtained with the different peptides did not correspond to those obtained with equivalent amounts of the free amino acid. The methods, therefore, are not applicable to the determination of tryptophan in intact proteins or their partial hydrolysates.

Non-essentiality of vitamin B_1 for the biosynthesis of nicotinic acid from tryptophan, by Acharya, U. S., Sundaram, T. K. and Sarma, P. S., *J. sci. industr. Res.*, 1958, **17C** (2), 26.—The possibility of vitamin B_1 being involved in the metabolic-conversion of L-tryptophan to nicotinic acid has been examined in three different biological systems, namely the larva of *Corcyra cephalonica* St., germinating green gram seedling (*Phaseolus radiatus*) and the resting mycelium of *Neurospora crassa*. It has been observed that thiamine is not an indispensable factor for the biosynthesis of nicotinic acid from tryptophan in the systems.

Effect of glucose-cyclo-aceto-acetate on ascorbic acid depletion in the tissue of scorbutic guinea pigs, by Behki, R. M., Motlag, D.B. and Nath, M. C., *J. sci. industr. Res.*, 1958, **17C** (2), 29.—The effect of glucose-cyclo-aceto-acetate administration on the excretion of 17-keto-steroids by scorbutic guinea pigs and on the glutathione and cholesterol contents of their blood and adrenals has been studied. Ascorbic acid and dehydroascorbic acid contents of various tissues of the animals have been estimated. Glucose-cycloacetoacetate administration does not appreciably affect the excretion of 17-ketosteroid in the scorbutic animals, but the cholesterol content of the adrenals increases considerably on the 14th day. The animals show less depletion of ascorbic acid in the tissues as compared to the controls, the effect being more pronounced in the adrenals.

FISH

A preliminary study of the distribution of non-protein nitrogen in some marine fishes and invertebrates, by Velankar, N. K. and Govindan, T. K., *Proc. Indian Aca. Sci.*, 1958, **47** (4), 202.—The distribution of non-protein nitrogen in some marine fishes, crustacea and molluscs was studied. The non-protein nitrogen constituted about 10 per cent of the total nitrogen in the teleosts, 20 per cent in the crustaceans and molluscs and over 30 per cent in the elasmobranches. High levels of free α-amino acid nitrogen (300 mg. N/100 g. of wet muscle) were found in the crustaceans and molluscs unlike in the fishes (20 to 40 mg. N/100 g. of wet muscle). The trimethylamine oxide content varied greatly in the fishes etc. The significance of these results from the comparative aspect and in fish processing is discussed.

FRUIT AND VEGETABLE PRODUCTS

Papyrographic characterization of sugars in some edible wild fruits of Naini Tal, by Gupta J. C., Gupta, D. R., and Gupta, S. C., *Sci. & Cult.*, 1958, **23** (9), 480.—The AA have studied the nature of sugars present in fruits of some wild plants consumed by people in the Kumaon region through chromatographic techniques. Juices of fresh ripe fruits of *Myrica nagi* Thumb (Kaiphal), *Berberis lycium* Royle (Kilmorha), *Rubus lasiocarpus* Smith (Kala Hisalu) and *Crataegus crenulata* Roscb. (Gibingaru) were prepared and clarified. Only 0.004 ml. of each of the fruit juices was spotted on Whatman No. 1 filter paper and *n*-butanol-acetic acid-water (4:1:5 v/v) was used as solvent. After developing the papers, the sugars were located on the chromatograms by spraying with benzidine reagent. The R_f values of different sugars were also determined. It was found that sucrose, glucose and fructose were present in the fruits of *Rubus lasiocarpus;* glucose and fructose in *Myrica nagi* and *Berberis lycium;* and glucose only in *Crataegus crenulata.*

K.L.R.

INSECTICIDES

Selective action of certain organophosphorus compounds, by Nagaraja Rao, K. R., *Sci. & Cult.*, 1958, **23** (9), 483.—In this paper, the results of a study of the action of three organophosphorus insecticides viz., Pestox 3H, Systox and Folidol E. 605 towards test insects comprising adults and grubs of uniform of *Cryptolaemus montrouzieri* Muls. (a common predator on mealy bugs) and *Chilomenes sexmaculata Fabr.* (a predator on aphids), have been reported. The formulations were sprayed on the test insects taken in petri dishes at two concentrations of 0.075 and 0.15 per cent. The insects were allowed to remain in contact with the chemical for 10 minutes after which they were transferred to clean glass jars and fed on their normal food. Mortality counts were recorded at intervals of 24, 48, 72 and 96 hours. The results show that Restox 3H has only a feeble contact action against the adults and grubs of Coccinellids Systox produced an average of 25.2 per cent mortality of the grubs in 96 hours, while its action on the adults during the same period was milder, working out to only 17.8 per cent mortality. With Folidol, a very high percentage of adults as well as grubs were killed and as such it may not satisfy the requirements of a selective insecticide. Systox is less toxic than Folidol. When a heavy predator population is noticed in association with a pest, it would, however, be advantageous to use only Pestox 3H which only seems to conform to the requirements of a selective pesticide.

K.L.R.

OILS AND FATS

Studies on indigenous cottonseed: Part IV—Recommendation for storage of cotton seed and its oil in India, by Subrahmanyam, V. V. R., Ach K. T. and Saletore, S. A., *In Oilseeds J.*, 1958, **2** (1), 23.— AA have presented a su experimental results of the on the storage of cottonseed an oil. Moisture plays an important in fixing up the quality of the sto cottonseed. Above a critical moisture level of 10 per cent (i 70 per cent atmospheric R. storage of slid results in rapid crease of free fatty acidity in the and loss of seed viability. If seeds are dried and stored in a tight tins, it keeps well for near months. Seeds stored in bags a stacked deteriorated much fa than seed heaped on the floor. T results of storage studies on cotto seed oil show that changes obser in the crude oil were similar to tho found in seed storage. Free fat acid development is less mark but colour development is greate In the case of refined or bleach oils, the colour and free acidi development during storage i negligible. The crude cottonsee oil is extremely stable both in she storage, and in accelerated test Refined oil is found to be less stab than crude oil. Rancidity by orga noleptic evaluation has been detected only in accelerated tests, but no in shelf storage even at peroxide values of 200. Based on the findings, a few recommendation for the storage of cottonseed and its oil with a view to preventing the formation of darker colour in refined oils as compared to American varieties, have been suggested.

K.L.R.

Effect of storage on the stability of hydrogenated fats in different containers, by Pat V. S. and Magar, N. G., *Indian Oilseeds, J.*, 1958, **2** (1), 27.—Hydrogenated fats have a longer storage life as compared to the parent oils and major portion of it, is now marketed in tinned cans. During war time, due to the scarcity of tin and steel, glass jars and papers (cellophane laminated etc.) w used as containers. The AA have studied the stability of hyd nts packed in glass, Al and tin ontainers stored under commercial onditions and factors which affect heir keeping quality such as heat, ight, original quality of oil and metallic contaminations. Four samples of freshly processed hydrogenated fats viz: Dalda, Marva Standard, Lotus Civil and Lotus (Bakery) all having negligible initial eroxide value were put in tin and Al cans 4 glass bottles of same capaity and stored at R. T., 37° C and 43° C for a period of 360 days. Peroxide value and organoleptic cceptability were determined at periodical intervals. The results have been given in a table. It is found that the P. V. of the hydroenated fats increases progressively with increase in storage temperature. In the case of samples kept at R. T., there is no significant difference in the P. V. in the three containers upto 360 days. At higher storage temperatures, however, the metallic containers accelerate the peroxide development as compared to glass. Tin container is found to be supeior to aluminium ones. The oxidation of fat occurs much faster at 43°C than at 37°C showing thereby that higher the storage temperaure, quicker is the oxidation.

K.L.R.

GENERAL

Some physical and chemical properties of tamarind kernel powder: Part II—Moisture sorption and gelatinization characteristics of raw, roasted and purified tamarind kernel powder, by Macmillan, W. G., Nag, S. and Chakraverti, I. B., *J. sci. industr. Res.*, 1958, **17B** (2), 75.—The moisture adsorption and gelatinization characteristics of raw, roasted and purified tamarind kernel powder (T. K. P.) have been compared. Roasting reduces both hygroscopicity and gelatinizability of T. K. P., this reduction becomes marked when the roasting temperature exceeds 125°-50°C. The importance of these findings in relation to the sizing quality of the product has been indicated. The increased hygroscopicity on purification of the polysaccharide and the decreased gelatinizability of the raw flour on roasting can be explained on the basis of a combination existing between the polysaccharide-non-polysaccharide fractions in raw T. K. P.

The exponential relation between moisture regain and relative humidity as deduced by Peirce for starch is not strictly applicable to the purified T. K. polysaccharide, and the observed variation has been explained on the basis of the difference of moisture affinity of the primary and secondary alcoholic groups of the sugar residues.

The moisture adsorption isotherm for T. K. P. is sigmoid and considerable hysteresis between adsorption and desorption isotherms exists. The isotherm of the purified product shows inflections at 10 per cent and 73 per cent R. H. corresponding to moisture regain values of 4.6 per cent and 18.0 per cent respectively, i.e., a ratio of 1:4 for the regains at the two inflection points. Estimation of furfural and total reducing sugar in purified T. K. P. shows a ratio of 2:1 for the hexose to pentose residues. A basic unit consisting of two hexose and one pentose residues gives a ratio of 1:4 for the primary to the total alcoholic group present in T. K. P. polysaccharide and the ratio of the regains at the infliction points corresponds to the ratio of primary to the total alcoholic groups. The results are in conformity with the views put forward by Assaf, Haas and Purves for cellulose in that the first inflection point is due to the strong adsorption of water to the primary alcoholic groups and the second point corresponds to the complete coverage of the accessible hydroxyl groups.

Amino acid make up of 'Niacinogen', by Das, M. L. and Guha, B. S., *Sci. & Cult.*, 1958, **23** (9), 498.—The AA earlier reported the isolation of 'niacinogen containing nicotinic acid bound with a peptide from rice bran and wheat bran. The isolated compound from both the sources have been hydrolysed with 6 N.HCl and analysed by one as well as two dimensional ascending and descending chromatographic procedures. The chromatogram has been compared with that obtained in the case of a known mixture of amino acids. The following amino acids have been found to be present in both rice and wheat bran niacinogens: aspartic acid, glutamic acid, serine, glycine, threonine, alanine, tyrosine leucine, isoleucine, phenylalanine, proline, arginine, histidine, lysine, cystine, methionine, and valine. From the amounts of amino acids in the two niacinogens, it appears that the two substances are closely allied but may probably be not identical. The nitrogen content of the molecule of niacinogen are accounted for by the nitrogen content of the individual amino acids and niacin.

K.L.R.

PART III (Foreign)

ANALYTICAL

Liberation and determination of riboflavin in natural feedstuffs, by Murthy, V. M. R., *et al.*, *J. agric. Fd. Chem.*, 1958, **6** (2), 129.—Two simplified procedures are outlined for liberation and determination of riboflavin from natural feedstuffs: extraction of riboflavin by steaming with water and subsequent microbiological assay, and steaming with very dilute hydrochloric acid followed by adjustments, adsorption of Florisil, and treatment with potassium permanganate have been eliminated.

The use of alkaline earth metal picrates for the isolation of L-phenylalanine from protein hydrolysates, by Selim, A. S. M., Ramadan, M. E. A. and El-Sadr,

M. M., *J. biol. Chem.*, 1957, **229** (2), 547.—Use has been made of the finding that phenylalanine forms sparingly soluble complex salts with the alkaline earth metal picrates for the isolation of this amino acid from protein hydrolysates. The method is based on the separation of phenylalanine by charcoal chromatography from the other amino acids which also furnish sparingly soluble complex derivatives with these metal picrates. The present procedure possesses the advantages that it is simple and economical and it allows the isolation of pure L-phenylalanine in yields which are appreciably higher than those secured by previously described methods.

BIOCHEMISTRY AND NUTRITION

Effect of nonionic emulsifiers on experimental dietary injury of the liver in rats by Gyogry, P., Forbes, M., and Goldbaltt, H., *J. agric. Fd. Chem.*, 1958, **6** (2), 139.—The intestinal flora may influence experimental and clinical injury of the liver. Because it has been claimed that emulsifiers may change the intestinal flora, their effect on experimental hepatic injury was studied. Emulsifiers of the polyoxyethylene series, and mono-glycerides in doses of 1 per cent of total food intake, had no influence on development of experimental hepatic necrosis. Even in doses up to 10 per cent no effect was noticed on experimental cirrhosis of the liver. Some emulsifiers in doses of 5 and 10 per cent slightly retarded production of experimental hepatic necrosis. It is improbable that in the doses used in practice these emulsifiers have a deleterious effect on the liver.

A new type of bread: Wheat-and-Rice-Bread, by Suarez, A. M *Food Technol.*, 1958, **12** (1), 15.—A wheat-and-rice-bread is offered as a substitute for common wheat bread. Its organoleptic qualities are equal to other breads. The nutritional requirements for a good bread are met. Use of 30 per cent rice replacing wheat flour was chosen as a result of considering Venezuelan agro-economical and nutritional conditions. Protein efficiency of the wheat-and-rice-bread was greater by 9.1 per cent and the growth of rats by 7.7 per cent as compared with wheat bread even though the latter contains 12.73 per cent protein whereas the wheat-and-rice-bread contains only 11.78 per cent protein. The new wheat-and-rice-bread can be made in any bakery and only requires 25 per cent more yeast than is usual. But it must ferment 15 minutes longer under the action of yeast, when the straight dough method is applied. The wheat-and-rice-bread could have a favourable influence on Venezuelan economy, since rice is a product that this nation produces in considerable volume.

Quantitative determination of nucleic acids in whole tissue by paper chromatography by Kleinschmidt W. J. and Manthey, J. A., *Arch. Biochem. Biophys.*, 1958, **73** (1), 52.—A method is described for the direct analysis of small tissue samples to determine total ribonucleic acid (RNA) and total deoxyribonucleic acid (DNA) content. The base constituents of both RNA and DNA are separately determined by the same two-dimensional system of paper chromatography which removes contaminating hydrolysis products from the chromatograms. The RNA and DNA contents are calculated from the analytical values of the base components. The procedure has been calibrated by employing known quantities of the separate nucleotides as standards. Variations in the results of replicate analyses of single tissue samples have been described employing statistics.

The ratios adenine/thymine, guanine/cytosine, and (adenine/thymine) (guanine/cytosine) of the DNA results approach unity and therefore correspond to accepted concepts of DNA structure. The adenine/uracil, guanine/cytosine, and (adenine/uracil) / (guanine/cytosine) ratios of RNA also approach unity. The relevance of these r the structure of RNA is disc briefly.

Prevention of acetoacet induced diabetes by the c densation product of gluc and acetoacetate and its spar effect on blood GSH, by M. C. and Behki, R. M., *Biochem. Biophys.*, 1958, **73** 65.—The effect of the salt of the condensation pro of glucose and acetoacetate (gluc cycloaceto acetate) on the ace acetate induced hyperglycemia a blood GSH depletion has be studied. The rabbits maintai normal levels of blood GSH blood sugar when an equimolecu amount of the Na salt of this p duct was administered 3 mi before the single as well as repeat daily injections of acetoacetate 41 days. The hydrolyzed gluc cycloacetoacetate has been four to react with dehydroascorbic a *in vitro* to reduce it to ascorbic aci

CEREALS

Non-starchy polysaccharide of cereal grains: VIII. Autolysi relationships of barley pento sans, by Preece, I. A. and M MacDougall, *J. Inst. Brew.*, 195 **63** (6), 520.—During the autolysis c barley the pattern of behaviour c water-soluble pentosans is obscure by the massive changes in B-gluca though the amounts of soluble pen tosans increase during the 4-hou autolysis period applied. Macham cal factor appear to play an impor tant part in pentosan solubilizatio both in regard to simple penetrati of the tissue by the solvent and al to the influence on this penetration of the enzymolysis of non-pentos materials, particularly, perhaps, B-glucan and protein; this conclusio seems to have special significance during the early days of malting and emphasizes the importance which should be attached to t physical condition of the grain.

Wheat starch pastes and gels containing citric acid and sucrose by Campbell, A. M. an Briant, A. M., *Food Res.*, 1957, 22

4), 358.—Results of a factorial xperiment for studying the relaonship between amylose in soluon and gel formation and the ffect of granule size, citric acid and ucrose on some properties of astes and gels of wheat starch, have een reported.

J.S.P.

Review of organic chemical effects of heat on milk, by Patton ., *J. agric. Fd. chem.*, 1958, **6** (2), 32.—Many heat-induced changes in milk and its products can be tudied appropriately by an organic chemical approach. Research progress using such an approach is discussed in terms of lactose-protein interaction (browning) and flavour changes in the fat and non-fat phases of milk. The need for research concerning effects of heat on milk fat is emphasised. To make milk a more flexible and useful raw material and to overcome some of its tendencies toward chemical deterioration, custom manufacture of milk components, such as the fat and protein, should be more extensively developed by the dairy industry.

FERMENTATION

Preliminary observations on the composition of some Australian bottled beers: I. Proximate analysis, vitamin content and calorific value, by Bottomley, R. A. and Lincoln, G. J., *J. Inst. Brew.*, 1958, **64** (1), 50.—In Australia, the *per capita* consumption of beer is approximately 24 gal. per annum, about one-third being consumed as bottled beer. Samples of each of seven brands of bottled beer, obtained from breweries throughout Australia, were analysed with the following average results: sp. gr., 1.008 at 20/20°C; alcohol, 4.67 per cent by vol.; total solids, 3.88 per cent (w/v); total reducing sugars (as maltose), 1.76 per cent (w/v); phosphorus, 19.6 mg. per 100 ml.; calories, 236 per pint; thiamin, 0.016 mg. per pint; riboflavin, 0.14 mg. per pint; niacin, 6.0 mg. per pint.

Preliminary observations on the composition of some Australian bottled beers: II. Total nitrogen and free amino acid content, by Bottomley, R. A. and Powell, A. D. G., *J. Inst. Brew.*, 1958, **64** (1), 53.—An analysis of the total nitrogen and α-amino nitrogen content of seven samples of Australian bottled beer indicated an average figure of 46.3 mg. per 100 ml. and 6.9 mg. per 100 ml. respectively. Quantitative resolution of the free amino acids from three beers was effected by ion exchange chromatography. Proline was the predominant amino acid; γ-aminobutyric acid, glycine/alanine, tyrosine/phenylalanine, and the basic amino acids lysine, histidine and tryptophan were present in substantial amounts. Glutamic acid, valine, leucine and isoleucine were invariably present, while β-alanine, methionine and arginine were infrequently found. Serine, aspartic acid, threonine and asparagine were sometimes present but in very small quantities; no hydroxyproline could be detected.

FISH

2-Thiobarbituric acid method for the measurement of rancidity in fishery products: II. The quantitative determination of malonaldehyde by Sinnhuber, R. O. and Yu, T. C., *Food Technol.*, 1958, **12** (1), 9.—Oxidative rancidity in fat-containing foods leads to the formation of malonaldehyde or derivatives of this compound. The red reaction product formed by the reaction of malonaldehyde and 2-thiobarbituric acid (TBA) is an effective means of measuring the extent of antoxidation. TBA procedures previously described, though useful in studying the development of oxidative rancidity, are of empirical design. A quantitative, 2-thiobarbituric acid procedure for measuring malonaldehyde, using the stable compound 1, 1, 3, 3-tetraethoxypropane as a standard, is proposed. Acid hydrolysis of 1, 1, 3, 3-tetraethoxypropane yields malonaldehyde which reacts with 2-thiobarbituric acid, under the conditions described, to afford a quantitative method for determining malonaldehyde. The term, TBA number of milligrams of malonaldehyde per 1000 g. of material, is suggested. Reaction time, total recovery, and spectral characteristics of this reaction compound are presented. The method is sensitive to 10-8 moles of malonaldehyde in 100 ml. of solution. The autoxidation that occurs in frozen tuna scrap and the effect of the antioxidants, dephenyl-p-phenylenediamine (DPPD) and Tenox IV, in preventing oxidative rancidity was followed with this procedure.

FRUIT AND VEGETABLE PRODUCTS

Mechanism of browning of ascorbic acid-citric acid-glycine systems by Lalikainen, T. Joslyn M. A. and Chichester, C. O., *J. agric. Fd. Chem.*, 1958, **6** (2), 135.—To determine whether Strecker degradation of amino acids occurred in the browning of orange juice, the browning of ascorbic acid in citrate-buffered solutions containing radioactive glycine was studied. Neither Schiff bases nor volatile aldehydes were detected. Less than 3 per cent of the carbon dioxide evolved was derived from glycine-C_1; less than 0.1 per cent from glycine-C_2. The data indicated that the Strecker degradation does not occur, in detectable degree, under the test conditions. The browning of this system, therefore, does not follow the usual pathways reported for the glucose-glycine system.

Determination and isolation of the non-volatile acids of pome fruits and a study of acid changes in apples during storage, by Hulme A. C. and Wooltorton, L. S. C., *J. Sci. Fd. Agric.*, 1958, **9** (3), 150.—A comprehensive scheme using ion exchange and partition chromatography is described for the determination of non-volatile organic acids of pome fruits. The method is used to investigate changes occurring in the acids of the peel and pulp of mature Bramley's Seedling apples during storage at 15°. These changes involve not only the aliphatic acids malic, citramalic and citric, but also the alicyclic acids quinic and shikimic.

The chemistry of naras seed (*acanthosicvos horrida*, hook). III.—The amino-acid composition of the protein, by Schwartz, H. M. and Burke, R. P., *J. Sci. Fd. Agric.*, 1958, **9** (3), 159.—The amino acid composition of naras protein is shown to be, in general, very similar to that of edestin which it resembles in physical properties. There are, however, significant differences in the content of tryptophan, arginine and glutamic acid. From the point of view of nutritive value, naras protein is deficient in lysine.

Some volatile aroma constituents of *vitis vinifera* var, Muscat of Alexandria, by Webb, A. D. and Kepner, R. E., *Food Res.*, 1957, **22** (4), 384.—The volatile essence was found to consist of methanol, ethanol, n-butanol, 3-methylbutanol, n-hexanol, 2-butanone, 2-hexenal, methylacetate, ethylcaproate, a butyrate ester, a valerate ester, ethyl esters, and acetals. The concentration of these components in the grape berries were estimated. Possible modes of formation of a number of these components have been discussed.

J.S.P.

Comparison of xanthophylls from leaves and orange juice, by Curl, A. L. and Bailey, G. F., *Food Res.*, 1957, **22** (3), 323.—The xanthophylls of elm leaves and orange juice have been compared. The diols obtained from leaves had all been found previously in orange juice carotenoids but in quite different proportions. The polyols from leaves were different from those of orange juice. In leaves, lutein was the principal xanthophyll and was accompanied by much smaller amounts of zeazanthin. The second most abundant xanthophyll in leaves was violaxanthin. Its identity was confirmed as zeaxanthin 5, 6, 5′, 6′-diepoxide and not as lutein 5, 6-epoxide. Very minor amounts of pigments tentatively identified as lutein 5, 6-epoxide and antheraxanthin were found. Neoxanthin, a major xanthophyll in leaves, was different from the trollixanthin-like polyol of oranges. It is apparently a trihydroxy 5, 6-epoxide with one cis-bond and is unusual in that the corresponding all-trans isomer does not occur withit. J.S.P.

Texture changes in frozen montmorency cherries, by Gee, M. and McCready, R. M., *Food Res.*, 1957, **22** (3), 300.—Results of time-temperature tolerance studies on frozen Montmorency cherries have been reported. The cherries toughened during storage at elevated temperatures (20° F and higher), but the texture was stable when stored at —10° F. Characterization of the pectic substances showed a lower percentage of esterification of the toughened cherries. Change in texture may be attributed to an enzymatic diesterification and the formation of a calcium pectinate gel. from calcium present in the fruit tissues combining with carboxyl groups when the cherries are not frozen solid as they are at —10° F. J.S.P.

Bitter flavour in carrots: III. The isolation of a compound with spectral characteristics similar to hydrocarbon extracts of bitter carrots, by Sondheimer, E., *Food Res.*, 1957, **22** (3), 296.—A crystalline substance has been isolated from bitter carrots which approximates the ultraviolet spectral characteristics of hydrocarbon extracts from the bitter carrots. Some of the physical properties and analytical data of the compound are reported. An empirical formula of $C_{11}H_{12}O_4$ is suggested for the compound. Evidence is presented that the bitter off-flavour of carrots is due to several components and that the isolated crystalline compound is one of them. The compound A has been identified as 3-methyl-6-methoxy-8-hydroxy-3, 4-dihydro-isocoumarin. J.S.P.

INSECTICIDES

Determination of total chlorine in pesticides by reduction with a liquid anhydro ammonia-sodium mixture, Beckman, H. F., *et al.*, *J. agric. Chem.*, 1958, 6 (2), 104.—Sod reduction in anhydrous ammo has been applied to the determi tion of total halides in insectic The method is fast and requ very little sample handling. ples may be completely analyzed 30 minutes. The method shou be of particular interest to pestic manufacturers and regulatory a cies. With slight adaptation, t technique could be applied to re due studies.

Pyridine-alkali reactions i the analysis of pesticides co taining active halogen atom by Burchfield, H. P. and Schul P. H., *J. agric. Fd. Chem.*, 1958, (2), 106.—A number of pesticide such as the dichloro-s-triazines, fluoro-2, 4-dinitrobenzene, 3, dichlorotetrahydrothiophene-1, dioxide, and N-(trichloromethy thio-) 4-cyclohexene-1, 2-dicarb ximide, which contain acti halogen, can be determined quant tatively by colorimetric procedure which are based on reactions wit pyridine and alkali. Qualitative test have been obtained with othe fungicides, insecticides, herbicides and fumigants. These reaction may have broad applications in th analysis of many of the pesticides used in agriculture.

TEA

Studies on the 'fermentation' of Ceylon tea. X. Pectic enzymes in tea leaf, by Ramaswamy, M. S. and Lamb, J., *J. Sci. Fd. Agric.*, 1958, **9** (1), 46.—Fermenting tea leaf produces methanol as the result of enzymic demethylation of pectins contained in the leaf. The enzyme concerned (which was isolated and purified) is very similar to pectin-methylesterases found in other plants.

The activity of tea pectin-methylesterase is partially inhibited by tea catechins and their oxidation products, but nevertheless a continuous demethylation process gi rise to pectic acid during th urse of fermentation. In one rticular case, a leaf mass excep- onally rich in pectin and pectase ve indications of gel formation.

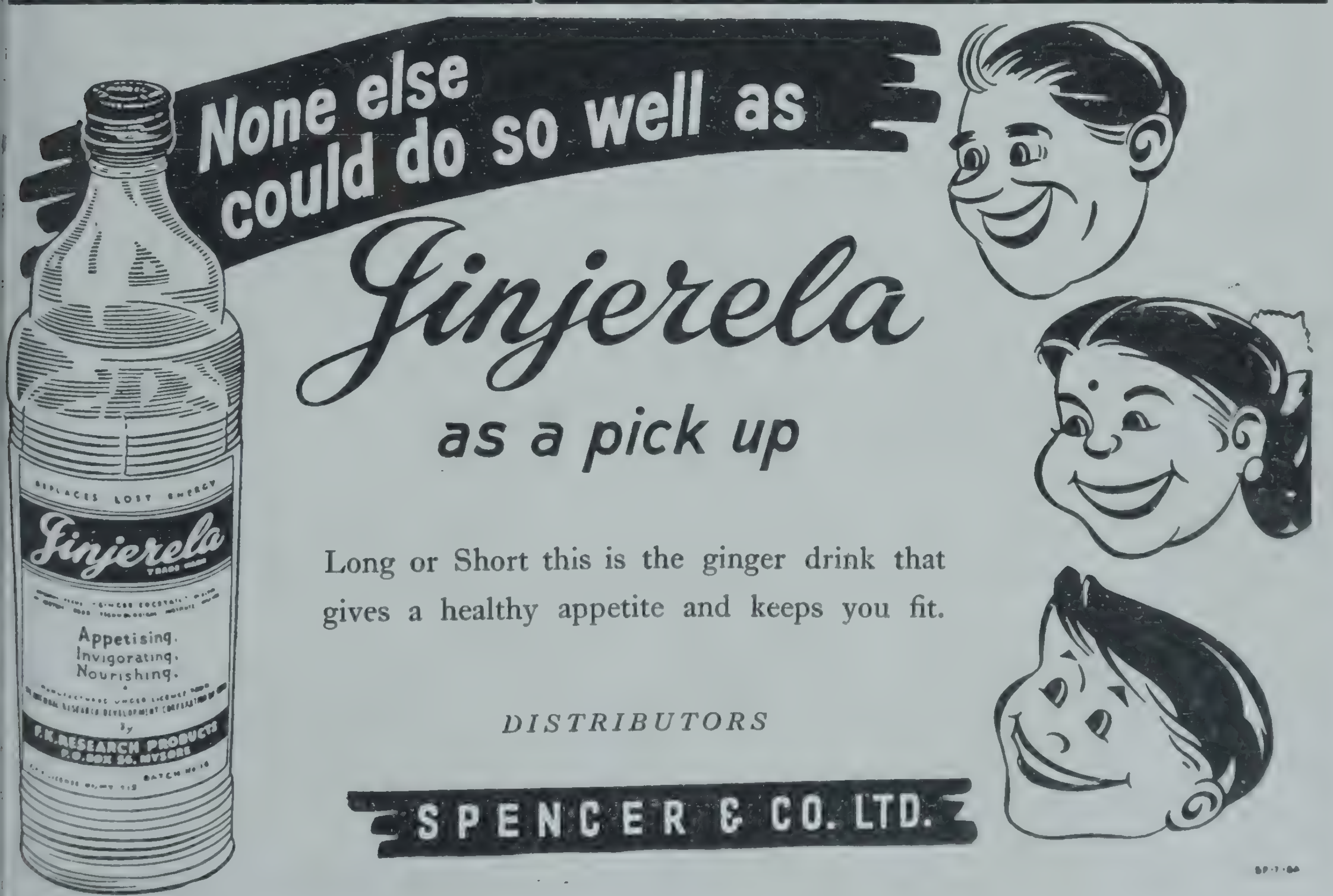
The significance of the pectic id formed during tea 'fermenta- on' is discussed.

Studies on the 'fermentation' Ceylon tea. XI. —Relations etween the polyphenol oxidase ctivity and pectin methylesterase activity, by Lamb, J. nd Ramaswamy, M. S., *J. Sci. Fd. gric.*, 1958, **9** (1), 51.—By initially ithholding the oxygen supply to rmenting leaf, thus allowing the rocess of formation of pectic acid y pectin-methylesterase actions proceed unhindered, it has been ossible to demonstrate a reduction oxygen uptake when the oxygen upply is restored. Addition of ectin to tea leaf both reduces xygen uptake during fermentation nd yields tea reported by tea sters as under-fermented. It is oncluded that there is strong resumptive evidence that the rate of fermentation of Ceylon tea is in some degree regulated by the pectic substances and enzymes which occur in the leaf.

GENERAL

Ultra-rapid method for measurement of the germinative capacity of barley grain, by Bishop, L. R., *J. Inst. Brew.*, 1957, **63** (6), 516.—In the marketing conditions under which many barleys are purchased, only a short time is available to assess the value of a sample. This makes it desirable to have a simple and rapid method of measuring the germinative capacity, and, such a method, using a substituted tetrazolium salt-iodo-nitro-tetrazolium — has been compared with the peeling method. The comparison indicates that (as with similar staining methods) this one is reasonably accurate in the important region near 100 per cent germination. With samples germinating less completely the agreement becomes progressively less exact; but, as such barleys are eliminated from the malting class by either test, the discrepancies are of lesser practical importance. The method gives a correct assessment of damage to germinative capacity from damp storage or from ageing.

As with other staining methods which rely on reduction, iodo-nitro-tetrazolium can give seriously erroneous results in a narrow region (which varies with moisture content) where the temperature has been just sufficient to kill the grain but not to destroy the staining reaction. However it is considered that when heat damage occurs in practice, e.g., in a farm drier, the changing conditions, particularly of moisture content, ensure that only a fairly small proportion of the grains show the erroneous result. Consequently it is considered that, as well as being rapid, the method is sufficiently reliable to be used as a help in the purchase of barleys.



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STUDIES ON THE NON-ENZYMATIC BROWNING OF FOOD PRODUCTS: SUGAR-ORGANIC ACID MODEL SYSTEMS

By N. S. Kapur, B. S. Bhatia, D. S. Bhatia and Girdhari Lal

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The subject of non-enzymatic browning in food products has received considerable attention from various workers but still the mechanisms involved are not completely understood. Earlier studies had centred round Maillard type reactions but in recent years the importance of sugar-organic acid complexes is also being increasingly emphasized. Using ion exchange resins and studying browning in different fractions of apricot concentrate, Haas and Stadtman[1] showed that, besides the reaction involving nitrogenous constituents, those between sugars and organic acids and those involving only organic acids were also important. Not only the hydrogen ion concentration but also the nature of the anion was found to be an important factor. Work carried out by Lewis *et al.*[2] and Livingston *et al.*[3, 4, 8] has further emphasized the importance of sugar-organic acid systems in the browning reaction.

In the present investigation, browning in organic acid-sugar model systems has been studied in detail. Four sugars (glucose, galactose, fructose and sucrose) and ten organic acids (acetic, propionic, oxalic, malonic, succinic, malic, tartaric citric, lactic and pyruvic) have been taken.

FOOD SCIENCE **JULY 1958**

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Experimental

The sugars and organic acids used were of analar quality and from fresh stock. All glass distilled water was used throughout the experiment and metallic contamination was strictly avoided.

Equal volumes of molar solutions of sugars and organic acids were mixed taking one sugar and one organic acid at a time and stored at $55 \pm 1^\circ$ C in glass stoppered pyrex conical flasks. Control sugars and organic acids were likewise stored. A few drops of xylene were added to the pure sugar solution to check mould growth.

Readings for ultra-violet absorption spectra were taken in the region 220-300 mμ at 5 mμ intervals using a Beckman's Du spectrophotometer. The intensity of visible colour was measured as optical density (O.D.) with Lumetron colorimeter using blue filter (420 mμ). Fluorescence readings were taken by Klett Summerson fluorimeter using a riboflavin filter (5200A°) after adjusting the instrument to a scale reading of 200 with 0.1 mg. per cent of aqueous quinine hydrogen sulphate.

Visual colour was also recorded and graded as light yellow (L.Y.)-O.D., 0.2-0.4; yellow (Y) -O.D., 0.4-0.5; deep yellow (D.Y.)-O.D., 0.5-0.6; light brown (L.B.)-O.D., 0.6-0.8; brown (B) -O.D., 0.8-1.2; deep brown (D.B.)-O.D., 1.2-2.0.

Observations were taken at 0, 1, 3 and 5 weeks of storage. The pH values of freshly prepared sugar solutions and of the systems stored for 5 weeks were taken using the Phillips electric pH meter.

5-hydroxymethyl-2-furfural (HMF) has been detected in all these systems by preparing 2:4 dinitrophenyl hydrazone and studying the absorption spectrum as described by Livingston *et al.* (*loc. cit.*)

Results and Discussion

(*i*) *Ultra-violet absorption spectra:* In Table I are recorded the amounts of brown precursors

TABLE I. *Production of hydroxymethyl-furfural mg. moles* per gram mole of sugar in the organic acid-sugar complexes and the respective position of the maximum (shown in the bracket) in the ultra-violet spectra (region 220–300 mμ) at 0, 1, 3 and 5 weeks of storage.*

	Sugars	Glucose	Galactose	Fructose	Sucrose
Organic acids * ...		0.02 (280) 0.36 (275) 0.52 (275) 0.64 (275)	0.15 (275) 0.58 (275) 0.74 (275) 1.09 (280)	0.03 (280) 0.35 (275) 6.36 (280) 18.49 (282)	—(NO) 0.35 (270) 0.38 (270) 8.30 (280)
1. Acetic acid ...	—(NO) —(260) —(NO) 0.69 (270)	—(—) —(255) 0.41 (275) 0.42 (280)	—(—) —(NO) 0.68 (278) 0.67 (275)	—(—) 0.36 (280) 2.73 (282) 5.70 (230)	—(—) 0.79 (285) 5.33 (285) 8.30 (285)
2. Propionic acid ...	—(NO) —(260) —(NO) 0.73 (273)	—(—) —(260) 0.44 (275) 0.58 (278)	—(—) —(NO) 0.65 (278) 0.81 (275)	—(—) 0.36 (275) 3.52 (280) 4.73 (280)	—(—) 0.56 (285) 4.97 (285) 6.21 (285)
3. Oxalic acid ...	—(NO) —(NO) —(NO) —(NO)	—(—) —(NO) —(NO) —(NO)	—(—) —(NO) —(NO) —(NO)	—(—) 16.06 (285) 73.45 (280) 77.27 (280)	—(—) 18.18 (285) 56.36 (285) 60.89 (285)
4. Succinic acid ...	—(NO) —(260) —(NO) 0.79 (270)	—(—) —(260) —(NO) 0.46 (280)	—(—) 0.21 (280) 0.72 (275) 0.85 (275)	—(—) 0.79 (280) 13.03 (280) 16.36 (280)	—(—) 1.53 (285) 8.06 (285) 11.88 (285)
5. Malonic acid ...	—(NO) —(NO) —(NO) 0.49 (275)	—(—) —(260) 0.61 (270) 0.58 (270)	—(—) 0.44 (270) 0.98 (275) 1.03 (275)	—(—) —(327) —(327) 19.04 (280)	—(—) 1.39 (285) 6.97 (285) 9.38 (285)
6. Malic acid ...	—(NO) —(NO) —(NO) —(NO)	—(—) —(NO) —(NO) 0.73 (280)	—(—) —(NO) 0.94 (285) 1.18 (280)	—(—) 1.27 (285) 1.67 (285) 23.94 (282)	—(—) 1.70 (285) 12.12 (285) 11.68 (285)
7 Tartaric acid ...	—(NO) —(NO) 0.61 (275) 0.57 (275)	—(—) —(260) 0.83 (280) 1.21 (285)	—(—) 0.17 (270) 1.03 (280) 1.12 (280)	—(—) 2.79 (285) 19.70 (285) 24.85 (282)	—(—) 5.10 (285) 19.39 (285) 25.15 (285)
8. Citric acid ...	—(NO) —(NO) —(NO) 0.63 (275)	—(—) —(NO) 0.88 (280) 0.94 (285)	—(—) 0.32 (270) 1.24 (280) 1.47 (280)	—(—) 4.18 (285) 24.24 (285) 33.94 (282)	—(—) 5.33 (185) 24.24 (285) 55.54 (285)
9. Lactic acid ...	—(NO) —(NO) —(NO) 0.63 (273)	—(—) —(260) 0.55 (280) 0.53 (283)	—(—) —(—) —(—) —(—)	—(—) 0.58 (280) 5.21 (285) 8.06 (285)	—(—) 11.33 (285) 7.70 (285) 12.43 (280)
10. Pyruvic acid ...	—(NO) —(NO) —(NO) —(NO)	—(—) —(NO) —(NO) —(NO)	—(—) —(NO) —(NO) —(NO)	—(—) 10.91 (285) 43.03 (285) 60.00 (285)	—(—) 10.06 (285) 38.49 (285) 51.51 (285)

* Calculated from E = 14.6×10^3 (Monograph on Furans[7])

(NO) denotes did not develop any peak

— (NO) denotes no production of HMF

— (—) denotes not recorded

formed, expressed as milligram-mole of 5-hydroxymethyl 2-furfural per gram-mole of the sugar-acid complex. The values in brackets indicate the position of the maximum.

It is seen from Table I that, in general, the position of maximum tends to shift towards longer wavelength during storage, indicating thereby the development of colour. All the sugars except sucrose show initially absorption in the region 260 to 280 mμ but finally the absorption shifts to 275-285 mμ. These maxima may be due to the caramelization of the sugar solutions at elevated temperature giving rise to 5-hydroxymethyl 2-furaldehyde (HMF) or 2-furfural[6]. None of the acids shows absorption initially and even after 5 weeks of storage, there was no peak in case of oxalic, malic, and pyruvic acids, while acetic, propionic, succinic, malonic, citric and lactic acids showed absorption at 270-275 mμ. In tartaric acid the peak at 275 mμ appears after 3 weeks of storage. This supports the view that tartaric acid on heating behaves like sugars. Strong acids like oxalic, malic and pyruvic do not produce HMF by themselves when heated but the relatively weaker acids produce some HMF.

Data in Table I show that after 5 weeks of storage, the HMF formed in glucose is only 0.64 milligram-mole per gram-mole while in fructose it is 18.49. Thus, it is seen that the maximum degradation takes place in the case of fructose. This is followed by sucrose, galactose and glucose.

Of all the acids, oxalic acid gives the maximum reaction with sucrose and fructose, the HMF produced being 60.89 and 77.2 milligram-mole per gram-mole respectively. There is no indication of any HMF being formed from oxalic acid-dextrose complex. This indicates that the ketonic sugar with a furanose ring undergoes dehydration at a faster rate than the aldehydic sugar (glucose, galactose) having a pyranose ring.

Of all the organic acids the largest amount of HMF is produced in oxalic acid, fructose system. A slightly lower value was obtained in oxalic acid-sucrose system. This is in agreement with the earlier observation of Haworth and Jones[5] who used oxalic acid for preparing HMF from sugars. The next higher homologue of oxalic

TABLE II. *Fluorescence value (expressed in units of the Klett Summerson Fluorimeter) using a filter at 5200 A° and standardising the instrument to 200 units against 0.1 mg. per cent of Quinine bisulphate solution of brown precursors involved in sugar organic acid complexes at 0, 1, 3 and 5 week of storage*

	Sugars	Glucose	Galactose	Fructose	Sucrose
Organic acid ...	...	24	20	1	5
	...	25	23	2	9
	...	48	60	104	28
	...	114	82	38	109
1. Acetic acid ...	1	—	—	—	—
	2	18	11	1	11
	50	28	25	73	46
	66	36	44	53	30
2. Propionic acid ...	1	—	—	—	—
	3	15	22	12	10
	18	15	23	80	51
	46	30	32	66	40
3. Oxalic acid ...	0	—	—	—	—
	2	9	14	12	13
	18	15	13	12	25
	26	20	27	—	—
4. Succinic acid ...	3	—	—	—	—
	16	23	15	13	17
	13	30	24	0	45
	18	42	42	6	25
5. Malonic acid ...	40	—	—	—	—
	64	44	49	1	57
	88	170	300	10	19
	132	262	300	—	14
6. Malic acid ...	40	—	—	—	—
	45	50	47	47	42
	85	64	68	3	96
	68	74	80	—	—
7. Tartaric acid ...	9	—	—	—	—
	14	19	17	18	20
	30	41	26	0	3
	40	55	45	3	13
8. Citric acid ...	1	—	—	—	—
	5	11	14	41	25
(1 : 1) ...	63	25	31	0	0
(1 : 1) ...	15	32	52	3	6
9. Lactic acid ...	5	—	—	—	—
	5	19	7	4	8
	48	25	—	63	52
	55	32	—	23	23
10. Pyruvic acid ...	5	—	—	—	—
	31	52	41	27	33
	52	70	20	30	18
	47	70	18	38	50

— denotes not recorded

acid viz., malonic acid produced a complex with fructose showing the maximum at 327 mμ in the first instance; the position of the peak shifted later to 280 mμ. Succinic acid did not show any such peculiarity. Acetic, propionic and lactic acids produced more HMF from sucrose than from fructose. Only a small quantity of HMF was produced in glucose and galactose complexes. Tartaric acid produced the maximum quantity of HMF from glucose when compared with other acids. Similarly citric acid gave the maximum production of HMF from galactose. Pyruvic acid, like oxalic acid, had marked influence on fructose and sucrose and no effect on glucose or galactose. Acetic and propionic acids appear to have a retarding effect on the production of HMF from all the sugars studied.

The quantity of HMF produced from sug organic acid complexes increased progressive during storage of 5 weeks.

(*ii*) *Fluorescence:* In Table II are record the values of fluorescence of the brown precurso in the organic acid-sugar systems. It may seen from Tables II and III that the value fluorescence first rises and later falls when th brown pigment is formed. Of all the acids, th influence of malonic acid on glucose and galacto is worth recording, where it gives the values 262 and more than 300 respectively.

(*iii*) *Colour Changes:* In Table III are recorde the optical densities of the solutions at 420 m The values in brackets give the visual gradation of the colour.

TABLE III. *Values of optical density at 420 mμ and visual colours (shown in brackets) in sugar-organic acid complexes during storage after* 3 and 5 weeks.*

	Sugars	Glucose	Galactose	Fructose	Sucrose
Organic acid		No (—) 0.083 (—)	No (—) 0.083 (—)	0.255 (Y) 0.693 (LB)	0.083 (—) 0.083 (—)
1. Acetic acid	No (—) No (—)	No (—) No (—)	No (—) No (—)	0.155 (LY) 0.460 (Y)	0.220 (LY) 0.480 (Y)
2. Propionic acid	0.420 (Y) 0.720 (B)	No (—) No (—)	No (—) No (—)	0.285 (LY) 0.470 (Y)	0.240 (LY) 0.360 (Y)
3. Oxalic acid	No (—) No (—)	0.260 (LY) 0.210 (LY)	0.160 (LY) 0.210 (LY)	1.900 (DB) 1.990 (DB)	1.600 (DB) 2.000 (DB)
4. Succinic acid	0.620 (LB) 0.814 (LB)	No (—) No (—)	No (—) No (—)	1.000 (B) 1.300 (B)	0.270 (LY) 0.580 (DY)
5. Malonic acid	No (—) No (—)	No (—) No (—)	0.175 (LY) 0.195 (LY)	1.600 (DB) 1.900 (DB)	1.050 (B) 1.500 (BD)
6. Malic acid	No (—) 0.140 (LY)	No (—) No (—)	0.175 (LY) 0.195 (LY)	1.400 (DB) 1.800 (DB)	0.825 (B) 1.270 (DB)
7. Tartaric acid	No (—) No (—)	No (—) No (—)	No (—) 0.090 (LY)	1.300 (DB) 1.700 (DB)	0.850 (B) 1.500 (DB)
8. Citric acid	No (—) No (—)	No (—) No (—)	No (—) 0.210 (LY)	1.500 (DB) 2.000 (DB)	1.100 (B) 1.700 (DB)
9. Lactic acid	No (—) No (—)	No (—) No (—)	No (—) No (—)	0.345 (Y) 0.720 (LB)	0.295 (Y) 0.7[illegible]0 (LB)
10. Pyruvic acid	0.370 (Y) 0.465 (DY)	0.280 (LY) 0.280 (LY)	0.560 (DY) 0.850 (LB)	1.600 (DB) 1.900 (DB)	1.375 (DB) 2.000 (DB)

No denotes optical density less than 0.05.

(—) denotes visibly colourless.

* denotes readings during storage at 0 and 1 week were also taken but since there was not much development of colour, they have not been included.

It will be seen that fructose solution by itself slowly changed in colour and after 5 weeks of storage turned light brown. There was no development of colour in other sugar solutions. Of the organic acids, propionic and succinic acid turned light brown; pyruvic acid, deep yellow and malic acid, light yellow. Other acids did not develop any colour during storage.

Complexes of glucose and organic acids showed the least colour development while those of fructose and organic acid showed the maximum.

Oxalic acid-sugar complexes were most intensely coloured although the acid by itself remained colourless. Pyruvic acid accelerates browning in sugars other than glucose. Other acids produced browning with fructose and sucrose solutions only.

In oxalic acid-complexes with fructose and sucrose a black solid deposit was also observed after 5 weeks' storage.

(*iv*) *p*H: Livingston *et al.* (*loc. cit.*) have reported that the pH plays a considerable role in the production of HMF. We have observed that in addition to pH, the nature of the acid is equally important. Oxalic acid, a strong acid, lowered the pH of the system to 1.15 in galactose and 1.20 in glucose but no HMF was produced in either case. This holds true also for pyruvic acid-glucose and galactose systems. In galactose alone, the final pH was 3.12 and HMF produced was 1.09 mg. mole per gram-mole while there was a considerably less production in most of galactose-acid systems having much lower pH values. In fructose-organic acid systems, malonic, tartaric, citric and pyruvic acid produced almost the same pH (1.78 ± 0.02), but the production of HMF varied from 60.00 to 19.04 mg. mole per gram-mole indicating the specific influence of the nature of the acid on the production of HMF. (Tables I and IV).

TABLE IV. *Final pH of each solution. The values in brackets indicate the initial pH*

	Sugars	Glucose	Galactose	Fructose	Sucrose
Organic acids ...	—	(5.50)	3.12 (6.53)	2.28 (4.56)	3.42 (5.74)
1. Acetic	2.56	2.76	2.95	2.42	...
2. Propionic ...	2.64	2.64	2.84	2.63	2.62
3. Oxalic	1.10	1.20	1.15	...	...
4. Succinic ...	2.34	2.56	2.20	...	2.30
5. Malonic ...	1.78	2.66	2.08	1.78	2.04
6. Malic	1.78	—	1.94	1.74	2.04
7. Tartaric ...	1.55	2.07	1.81	1.78	1.90
8. Citric	1.64	1.82	1.80	1.79	1.78
9. Lactic	—	2.26	...	2.16	2.12
10. Pyruvic... ...	1.45	1.66	1.90	1.76	1.76

(—) denotes not recorded

Summary

1. Of the four sugars, glucose, galactose, fructose and sucrose, fructose causes the maximum while glucose the minimum browning.

2. Of the ten acids, acetic, propionic, oxalic, succinic, malonic, malic, tartaric, citric, lactic and pyruvic, oxalic, malonic, malic, tartaric, citric and pyruvic acids make significant contribution to browning. Oxalic and pyruvic acids cause maximum browning in fructose and sucrose.

3. Organic acids (except succinic, propionic and pyruvic) themselves do not turn brown though they accelerate browning of sugars.

4. The maximum production of HMF occurred in oxalic acid-fructose system. Tartaric acid produced maximum amount of HMF from glucose and likewise citric acid from galactose.

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THE POLYPHENOLS IN BILWA PRESERVE (*Eagle marmelos*)

Preserves made from *Amla*, Apple, *Harar* and *Bilwa* are well-known in India for their reputed therapeutic values according to the Ayurvedic and Unani systems of medicine. In this connection, preserve made from *Bilwa* fruit is of particular importance in view of the fact that the unripe fruit is recommended as a cure for dysentery and diarrhoea, and the ripe fruit has a special tonic and laxative effect[1]. All the four fruits mentioned above are rich in polyphenolic substances which are known to have therapeutic values. It was, therefore, of considerable interest to study the nature of these substances present in *Bilwa* preserve.

The method standardised and adopted for making the preserve was as follows: Tender *Bilwa* fruits, with the shell in-tact, were cut transversely into 8 pieces and boiled in water to soften them. They were then picked with stainless steel forks, boiled for 4-5 minutes in sugar syrup of 33° Brix and then allowed to stand overnight. The process of making preserve was completed in the conventional manner by raising the Brix of the syrup by about 10° at every stage. The final syrup in which the fruit was boiled was of 72° Brix.

In a variation of the above process, using dry sugar and placing the slices in a stone-ware jar between alternate layers of sugar and keeping the jar at room temperature of 24-30° C for about 3 months, the final preserve was not quite so good as the one made by the conventional process, the slices being still hard in texture.

Both types of preserve were used for the determination of the polyphenols present in the Aqueous extracts of the fruit as well as the syru portions were spotted on Whatman No. 1 pape using sodium bisulphite-acetic acid as solven and the chromatogram developed by the descending technique. Tannic acid, pyrogallol, pyrocatechol, phloroglucinol and gallic acid were use in the reference mixture. After drying, the pape was sprayed with silver nitrate-ammonia reagen and the spots that appeared were compared wit the reference spots. Tannic acid was the onl polyphenolic substance present in the preserve *Bilwa* fruit as well as in the syrup. The therapeutic value of *Bilwa* preserve thus appears to be based entirely on the tannic acid present in it.

Further work is in progress to study the distribution of polyphenolic substances in other important preserves like those of *Amla*, *Harar*, etc.

The author feels grateful to Dr V. Subrahmanyan, Director of the Institute and Dr Girdhari Lal, Asst. Director, for their interest in this work and to Sri M. V. Sastry, Research Fellow for the assistance in chromatographic work.

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SUPPLEMENTARY VALUES OF THE PROTEINS OF BENGAL GRAM (*Cicer arietinum*) AND SESAME TO GROUNDNUT PROTEINS

Groundnut is one of the most important oil seed crops in India. It has been shown by different workers that specially processed low fat groundnut flour can be used as protein supplement in human diets[1]. Low fat groundnut flour has been used in the preparation of soup powders[2], Mysore flour[3], composite grains[4], low cost malt food[5], Multi-purpose food[6], tapioca macaroni[7] and nutro biscuits[8]. Though the proteins of groundnut have been reported to have a fairly high biological value[9], they are nevertheless somewhat deficient in certain essential amino acids *viz.*, methionine, threonine and lysine[10]. Bengal gram, a pulse cultivated in large quantities in India, is a rich source of lysine and threonine[10]. Sesame flour proteins have been reported to be rich in methionine[10]. Earlier studies[11] from thi laboratory have shown that addition of Bengal gram flour and sesame flour to groundnut flour, brought about a significant improvement in the protein efficiency ratio of the blend. It was, therefore, considered important to study the supplementary relations of proteins of sesame and Bengal gram to those of groundnut.

The samples of low fat groundnut and sesame flours and Bengal gram *dhal* used in the present study were prepared according to the process described by Subrahmanyan *et al.*[6]

The biological values of the proteins (protein efficiency ratio) of groundnut flour, Bengal gram, sesame flour and the supplementary relations of the proteins of Bengal gram and sesame to those of groundnut were determined by the rat growth method of Osborne, Mendel and Ferry[12] as modified by Swaminathan[13]. Six groups of freshly weaned young albino rats weighing between 40—50 g. (10 males in each group) were fed synthetic diets in which groundnut, Bengal gram, sesame or a mixture of these, formed the only source of protein. The diets were adequate with respect to other dietary essentials namely fat, minerals and vitamins. The level of the proteins in the diet was maintained at 10 per cent. In the case of diets containing proteins from two sources, each foodstuff contributed 5 per cent protein. Careful records of the daily food intake and the weekly increase in body weight were maintained. Protein efficiency ratios were calculated for periods of 4 weeks and 8 weeks. The results are presented in Table I.

TABLE I. *Supplementary value of the proteins of Bengal gram and sesame to those of groundnut*

Group No.	Source of protein in the diet	Protein efficiency ratio			
		in 4 weeks		in 8 weeks	
1	Groundnut flour ...	1.652	± 0.090 (35 d.f)	1.472	± 0.048 (35 d.f)
2	Groundnut flour + Bengal gram† ...	1.790		1.379	
3	Bengal gram (*Cicer arietinum*) ...	1.513		1.272	
4	Sesame flour ...	1.725		1.532	
5	Groundnut flour + Sesame flour* ...	1.993		1.726	
6	Groundnut flour + Sesame flour + Bengal gram** ...	2.027		1.790	

† Groundnut protein 5% + Bengal gram protein 5%.

* Groundnut protein 5% + sesame protein 5 %.

** Groundnut supplied 5 % of protein and sesame flour and Bengal gram supplied 2.5 % of protein each.

The results obtained in the present study clearly show that the proteins of sesame supplement markedly those of groundnut. This may be due to the mutual supplementation of amino acids of sesame proteins to those of groundnut proteins. The proteins of sesame are rich in methionine in which groundnut proteins are deficient[10]. It will also be observed that proteins of Bengal gram though rich in threonine in which groundnut proteins are deficient, did not supplement the proteins of groundnut to any significant extent. This may be due to the fact that the limiting deficiency in both groundnut and Bengal gram proteins is methionine[10]. On the other hand, the mixed proteins of groundnut, Bengal gram and sesame had the highest protein efficiency ratio, indicating thereby that the proteins in the three foods supplemented each other's deficiencies.

Our thanks are due to Mr A. N. Sankaran for the statistical analysis of the results.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during May-June, 1958 are given in this section.

S (IS) 14

Meat processing industry in India, by N. L. Lahiry (*May* 31, 1958).—The speaker, initiating the discussion on the problems relating to the processing and preservation of meat and meat products, said that the need for researches on this subject has been recognized in the Western countries as extremely important in the development of the meat industry and is, therefore, receiving considerable attention. Argentina, U.S.A. and Australia which are the major meat exporting countries have established separate research laboratories on Meat Technology so as to deal with several problems of the Industry. Continuing, the speaker said that more attention should be paid by the research organizations in India on meat technology, as a good proportion of the population is non-vegetarian.

Dr Lahiry then emphasized the fact that meat proteins are considered as complete proteins and that among the foods of economic importance, meat has the place second to milk. Except for calcium, all the minerals necessary for good health are contained in meats which also provide thiamine, riboflavin and to some extent vitamin A. Consequently, meat assumes its important place in human nutrition with considerable justification. Referring to his recent tour around the country to acquaint himself with the present position of the various food processing industries, the speaker stated that he could come across only three firms who are processing meat and meat products, *viz*., *Messrs A. Kalvert & Company* in Bombay packing canned mutton (curried and byriani), *Messrs Essex Farms* in New Delhi processing canned piggery products and *Messrs Central Dairy Farm* in Aligarh also engaged in packing of piggery products.

In the opinion of the speaker, all the three concerns need technical advice to enable them to improve the quality of their products for which they are very keen and added that many industrialists are very enthusiastic and are now contemplating to utilise the vast animal wealth for food both in the country and for export purposes. The speaker, therefore, very strongly felt that steps should be taken to start immediately a Meat Technological Unit at the Central Food Technological Research Institute. This Unit should devote its fullest attention to both the fundamental and the technological researches. In this connection, he pointed out that some of the lines of work which can be started straightaway are: (*i*) *Baby Foods* to be prepared from a combination of meat and vegetables, (*ii*) *Use of antibiotics in the preservation of fresh meat* which will require work in collaboration with the Mysore Slaughter House, (*iii*) *Canned Indian Meat Dishes* to be investigated for determining the exact minimum time and temperature necessary to render the product sterile, by the latest techniques for evaluation of processing conditions, (*iv*) *Dehydration of meat* with a view to preparing meat powder from lean meat of lamb; dehydrated precooked meat from fresh pork; freeze dehydrated chicken meat (high cost and great length of time required for the process being the main problems) etc., (*v*) *Production of quality bacon and ham* involving standardization of the processing technique as applicable to Indian conditions, and (*vi*) *Standards for meat products* required to be set up at the earliest.

Questions on some of the technical and informational aspects of the talk were replied by the speaker. The Chairman, Dr Girdhari Lal in his concluding remarks, emphasized the importance of meat research in the country for the benefit of the Industry in particular and expressed his firm belief and confidence in the success of the project recently initiated by Dr Lahiry at the Institute as a regular programme of the Division of Process Development.

S (IS) 15

Role of extension in the utilization of Scientific Research by H. A. B. Parpia (*June* 7, 1958).—The speaker pointed out at the outset the valuable role which Science and Technology have played in the modern society. In this respect, he particularly laid emphasis on the role of Food Science and Technology in storage, preservation, development of new foods and providing better nutrition to the people. If these modern means were not available to the human society today, perhaps, there would have been a tremendous food shortage and the survival of mankind would have become very difficult. The major contribution which the Indian Scientists can make is not only in the direction already pointed out but particularly by developing cheap nutritious foods from available raw materials especially the agricultural wastes. These developments would have no value unless they leave the laboratory and find application in the development of industries which could provide people with all these foods. The development of such an industry would also contribute considerably in providing employment and utilizing available resources.

Extension service is a two-way bridge which not only takes science to its venues of application but also rings back to the Research Insti- ute actual problems in the develop- ent of food industries and thus, rovides a more realistic bias to the esearch according to the needs of he country. If scientific research s to make a positive contribution n our country, it must be geared lirectly to the national develop- nent programme and serve its need y finding appropriate application nder the indigenous conditions.

The speaker further went ahead o emphasize the need for bridging he gulf between food science and ts venues of application such as, the different types of food industries, warehousing facilities in the country and even transportation and handling of raw material so as to prevent waste. If this is to be accomplished successfully, there is need to understand the socio-economic conditions existing in India. Without this, proper application would be impossible. The food processing industry in India is small and would be comparable to small-scale industry in a country like the United States, U.K., and Australia. The turnover is less, and therefore, the gross profit margin has to be high if the industry has to keep its head above water.

The *per capita* income of the people is very low and, therefore, the buying capacity is very small. Literacy in the country is only about 12 per cent and the people have developed certain food habits over centuries of cultural development which cannot be altered. Added to this, our society is full of prejudices and superstitions. Taking into consideration all these factors, it was proposed that the Extension Service for the Food Research Institute should be organised on the following basis:

(1) *Industrial Service:* (*a*) *Technical advice to the existing industry for improving their present processes:* This may involve improvement of the processes and even changes in the equipment, if necessary. The cost for such changes should be maintained as low as possible. Such an effort will go a long way in helping scientists to gain confidence of the industry. This can only be done by proper understanding of the industrial engineering as applied to our economic conditions, interest of the consumer and profit motive of the industrialist. The Institute has gone a long way in gaining this confidence today and the annual number of technical enquiries runs upto almost a thousand.

(*b*) *Preparation of plans for starting food processing industries of various sizes such as large, small and cottage scale:* Advice can be given to the private industrialist or the Small Scale Industries Service Institute on the basis of availability of raw materials, marketing facilities labour, power, etc., in different areas. This work has already begun and is making steady progress. It requires no new research but correct application of the available information.

(*c*) *Development of the processes for which scientific research has been done at the Institute:* This can be done by designing of the equipment, working out economics of the processes and establishing a full-fledged pilot plant unit at the Institute. A better alternative would be to gain sufficient confidence of some industrialists who would be willing to contribute towards the development of the process on a pilot plant scale and would share responsibility with the Institute, if not, accept it completely.

(*d*) *Publication of Technical Bulletins with specialised personnel* working on different industries such as biscuit, confectionery, oils and fats, fruits and vegetables, processed milk products, infant foods, flour-milling, storage, packaging and transport, etc. These Bulletins could be brought out in a comprehensive manner considering the indigenous problems.

(*e*) *Technical Periodicals:* In order to provide the industry with proper technical knowledge and information, it is necessary to have a regular periodical which would provide the industry not only with the work done in India but also in other countries. Therefore, a journal maintaining a proper abstracting and summarising service is very necessary. This work has to be carried on in a manner which can be useful to the reader and would stimulate his interest in trying to obtain the original article. It is also necessary to provide translations of such material published in foreign language journals. Most of this work is already being carried on at present through 'FOOD SCIENCE'. If food science *information circulars* could be sent out regularly, it would be a very useful contribution for the technologists as well as for the executives in the industry.

In order to help in the development of the industry and the utilization of the research work carried on at the Institute, it was suggested that we should patent processes so as to prevent their improper use, but these patents may be given free of charge on an area basis protecting the interest of the Institute as well as the industrialist. There should, of course, be a charge for exploitation of these patents abroad. After all, the main purpose of the Institute is to help in development of the industry by providing all facilities and removing obstructions in their way. The final gain would be the preservation of food, prevention of waste and additional employment for the people.

(2) *Rural Service:* This aspect of Extension Service is very valuable in India where 82 per cent of the population lives in villages. Besides, the raw materials for the food processing industry are produced in these areas. The problem of course, is quite serious with the existing sociological conditions. It is very necessary to gain complete confidence of the village folk before they would consider using any new food or a modern method of food preservation. Therefore, if a scheme has to succeed permanently, it must take a number of factors into consideration. The following scheme which has been partially tried already is proposed.

(*a*) Training of the village level workers and social education organizers in the Community

Development Blocks and National Extension Service through their training centres.

(*b*) Going to the rural people with the Community Project workers and teaching people simple methods of food preservation. At this juncture, it must be borne in mind that only one process at a time be tried to prevent confusion in the minds of the villagers. Maximum emphasis should be laid on proper storage, packing, handling and transportation of raw material.

(*c*) Home-scale preservation of various nutritious foods ultimately leading to a cottage scale industry, should be considered as a long range programme.

(*d*) Certain products such as groundnut milk curd, Multipurpose Food, Low-cost Malt Food, etc., should be tried after adapting them to the taste of the people so that they could be utilized by them for overcoming the dietary deficiencies so widely prevalent. These problems will vary from area to area, depending upon the type of food, already available and the food habits of the people.

(3) *Urban Service:* Though cities represent the modern industrial India, the problems existing in these areas are also serious. Very few people know how to preserve food on a homescale during the surplus seasons. Schools and colleges do not pay sufficient attention to this aspect of science. Emphasis, therefore, has to be laid on the work of the following type:

(*a*) Short courses in food preservation in ladies' colleges and schools as well as in other educational institutions.

(*b*) Training the people in food preservation through social service organisations, various clubs, etc.

(*c*) Training of the working class in improving their diets through utilization of Multipurpose Food, Groundnut Milk Curd and similar other foods.

The health conditions of working class is particularly precarious in some of our cities. These could be improved through utilization of cheap nutritious foods in industrial canteens with the help of management, ultimately leading to wider acceptance for the family use.

(4) *Follow-up of the work:* After the Extension Service teams have been withdrawn from the rural and urban areas, it is necessary to maintain a link with the various centres. This could best be done through suitable publications. We have already made a considerable amount of progress in this direction by starting two publications *i.e.*, 'Khadya Vigyan' in Hindi and 'Ahara Vijnan' in Kannada. Some of this literature has also been used in the adult education libraries with a considerable advantage. There is need for further popular writing and publishing simple pamphlets on Food Science. This could particularly be done through the various Community Project publications. Besides this, the workers must pay repeat visits to areas where work has already been done. This follow-up is very essential to sustain the interest created and enlist people's active co-operation.

It is very clear from the foregoing that science can help in improving economic conditions and the latter in turn can go a long way in helping science to progress for the good of an average citizen. This means every research, be it fundamental or applied, must be directed with a view to finding the final application. The role of Extension Service for the utilization of research results of Food Science and Technology can hardly be overemphasized.

S (IS) 16

Experiments on extension work in the Kerala State, by V. Balu (*June* 7, 1958).—The speaker referred to the development of tapioca macaroni and said that it was the result of seven years of work on a new line of research pertaining to the conversion of abundantly available, second-grade food materials into acceptable, first-rate foods that could be consumed in the same way as grains. The manufacture of tapioca macaroni presented several scientific and technological problems; nevertheless, a fair measure of success was obtained by the scientific workers. The next stage was, therefore, to investigate the possibilities of the food and verify consumer acceptance. This extension work of making tapioca macaroni acceptable to the people was a novel experiment in carrying a scientific finding to the masses.

First, a proper region had to be selected; after careful consideration, it was felt that the Kerala State offered the best possibilities, since it is the largest tapioca-growing region in the country and has a serious food problem. Also, the density of population in the Kerala State is the highest in India, with 974 persons living on a square mile. Further, it was felt that the work in the State would be easier on account of the high percentage of literacy and the better receptivity on the part of the common man, particularly in the villages.

In April 1957, the Director and other senior officers of the Central Food Technological Research Institute, Mysore, held some meetings and demonstrations in Trivandrum, and had detailed discussions with the Food Minister, Shri K. C. George. Later, the Food Minister and the Secretary for Agriculture visited Mysore and studied the working of the macaroni pilot plant. Then, in the presence of Prof. M. S. Thacker, Director-General, Scientific and Industrial Research, an agreement was drawn up between the Council of Scientific and Industrial Research, New Delhi, and the Kerala Government for the regular production of tapioca macaroni and its popularisation in the Kerala State, by a full-fledged extension team of the Central Food Technological Research Institute, Mysore.

The C.F.T.R.I. Extension Team began their work in Trivandrum in June 1957. They drew up a programme of work in consultation with the Food Minister and the State Government Departments of Agriculture, Development, Health, Public Relations and Board of Revenue as well as organizations like the Central Social Welfare Board. The co-operation of the State Development Department was specially sought to do the extension work in the rural areas in active collaboration with the community Development and the National Extension Service Blocks. A general programme of work to cover both the rural and urban areas in the nine districts of the Kerala State was drawn up. On account of the wide gap between the urban and rural areas, the work was suitably planned for the respective areas.

Public meetings were addressed at several 'nerve centres' of the State to pinpoint the importance of the campaign and mobilize general opinion. The talks were given in Malayalam, Kannada and Tamil. Audio-visual aids were used; songs and slokas were composed and rendered at the meetings, particularly in rural areas. At the close of the meetings, questions were invited from the people and answered. Often, a member from the audience was asked to give his first impressions about tapioca macaroni.

Nearly a thousand talks and demonstrations of cooking macaroni were given at National Extension Service Blocks, plantations, Mahila Samajams, Central Social Welfare Board units and other Women's Organizations. Different colleges, schools, hostels, factories, industrial canteens, rotary clubs and other clubs were also visited. Every effort was made to enlist people's support and participation.

Group discussions were held to liquidate unreasoned prejudices. Macaroni dishes were offered for taste-testing at the close of the discussions and meetings. The consumer acceptance tests established beyond doubt the palatability of the product.

Cooking demonstrations were specially planned to prove that macaroni can be cooked easily and effects economies in the matter of time and fuel. At the demonstrations, emphasis was laid on making inexpensive dishes like porridge and gruel. Cooking demonstrations were given to limited groups of people every time and all present were encouraged to take part. The interest of the people in rural areas was roused by conducting the demonstrations under easily reproducible conditions.

Close contacts were maintained with the Press. Several meetings for representatives of the Press were arranged. Articles on tapioca macaroni and recipes were published in newspapers and journals. Radio talks were given, and the extension workers participated in exhibitions held in different parts of the State.

The talks and demonstrations resulted in on-the-spot demand for tapioca macaroni. Three different shapes of the product, rice, shells and tubes, were made available to the people in one pound polyethylene bags, at 20 naye paise a pound. Wherever the team went, the off-take was good and nearly 100 tons of tapioca macaroni were sold. Actually, the demand was far in excess of the supply.

The speaker said that the extension work involved fighting several prejudices about the product which were reinforced by imaginary stories. Tapioca macaroni was associated with a political ideology in several parts of the State. It was also believed that the product contained frog's essence in view of the malayalam word 'Makri' signifying a frog. Another impression was that use of tapioca macaroni will adversely affect the sexual potency of humans. That the extension workers were able to achieve results in spite of these hurdles, emphasize the contribution the extension and development method can make in carrying the fruits of research to the doors of the people. Mr Balu said that nowhere was there absence of spirit and enthusiasm on the part of the people to improve their condition. Only their enthusiasm had to be tapped and their confidence gained. Changes in established food habits can take place only gradually and that too only when the people try to change them of their own accord and not due to sheer necessity. Therefore, more stress has to be laid on public education and the spread of knowledge, which alone can give the desired results by bringing about a change in the mental attitude of the people.

The extension workers of the Central Food Technological Research Institute returned to Mysore in May 1958 and the work is now being continued by a team of the Kerala Government.

The Kerala Government appointed a high-powered Tapioca Macaroni Project Committee in July 1957 to review the work of the extension team and push forward the programme. The committee held four meetings and felt that in view of the demand for tapioca macaroni, there was a case for starting several macaroni plants in the Kerala State and desired that an immediate beginning be made with at least one plant with a capacity of twenty tons per day. A sub-committee was appointed for the purpose consisting of Sri S. Govinda Menon, Sir Koman Nair and Dr V. Subrahmanyan (convener); the sub-committee prepared a comprehensive project report which was approved by the Committee and endorsed by the Union Food Minister, Sri A. P. Jain, Prof. M. S. Thacker and others in Delhi, at a recent meeting held there. At that meeting, it was decided to invite tenders and proceed with the setting up of the plant. In the meantime, the Kerala State Extension Team is continuing the work to help intensify the community support which tapioca macaroni has already secured and make it find a regular place in the dietary of the people.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Composition of jaggery

E (IS) 54

We shall appreciate if you let us know the composition of jaggery. What is the constituent present in jaggery that is responsible for inactivating the fruit pectins from their normal jellying capacity? (Madras).

The composition of jaggery as reported in Health Bulletin No. 23 is furnished below:

Moisture	...	3.9per cent
Protein	...	0.4 ,,
Fat (ether extractives)	...	0.1 ,,
Mineral matter	...	0.6 ,,
Carbohydrate	...	95.0 ,,
Calcium (Ca)	...	0.08 ,,
Phosphorus (P)	...	0.04 ,,
Iron (Fe)	...	11.4mg.%
Calorific value per 100 g.		383
Carotene (International vitamin A Units per 100 g.)	...	280
Nicotinic acid	...	1.0mg.%

It may, however, be noted that this is just an average composition and variations occur depending upon the method of preparation and the technique of processing. The bacterial and yeast count will also depend upon the conditions under which it is prepared.

There is nothing in jaggery except, perhaps, some sodium content which may interfere with the setting quality of pectin for preparing jellies. If the jaggery is badly contaminated then the bacterial and mould flora can hydrolyse the pectin. However, hygienically prepared jaggery has been used with some success in jellies although it may suppress the desired taste of a fruit if used.

Slow setting pectin

E (IS) 55

Please inform us as to how a slow setting pectin can be converted into a quick-setting pectin by some simple chemical addition. (Madras).

The setting quality of pectin depends upon its chemical composition as well as length of the pectin chain and the presence of methoxyl groups. Therefore, if the quality of slow set pectin has to be changed into a quick set pectin, it involves a complicated chemical process. Sometimes, however, it is possible to alter the setting quality a little by the addition of a small amount calcium. This makes the jellies set a little faster. We suggest that you may try and experiment on your pectin and see if this works. However, before you do this, you may kindly take into consideration the food laws which may not permit added calcium in certain products.

Canning of sardines in oil

E (IS) 56

Would you please write to us the details of the method of canning sardines in oil? (Cochin).

The canning methods used for sardines vary considerably and here below the various stages in the 'Fry Pack' method are described:

1. *Salting and cleaning:* On arrival, the fish are sprinkled lightly with salt and the head and viscera removed by hand.

2. *Brining:* They are immediately transferred to strong brine for ½ to 1 hour and then washed. Brining is for the purpose of removing slime, blood, and water; toughening the skin; whitening t meat; and salting the fish.

3. *Drying:* After washing, the are dried in the open air unless it damp or rainy weather. They m also be dried in a current of hot a at about 100°F for 60 to minutes.

4. *Frying:* The sufficientl dried fish are fried in hot pean oil for a few minutes. The surplu oil is drained off on a sloping tabl Frying is considered complete wh the back bone can be removed easil and shows no redness.

5. *Packing:* After cooling, th fish are packed usually in peanut o in cans, care being taken to avo broken pieces.

6. *Flavouring:* Various essential oils and condiments may be used to give added flavour to sardines.

7. *Exhaust:* The cans receive an exhaust to insure a proper vacuum.

8. *Sealing:* The hot cans from 'the exhaust box' are immediately sealed with the help of the 'double seamer'.

9. *Processing:* The sealed cans are processed in a retort under the following conditions:

Size of can	*Process time in minutes*	
1 lb. oval can—	*230°F*	*240°F*
606 × 403 × 108	110	80
½ lb. square (soldered bottom) —		
410 × 307½ × 103	95	

After processing, the cans a cooled with running water.

Manufacture and uses of desiccated cocoanuts

E (IS) 57

I shall be highly obliged if you kindly furnish me the details regarding the manufacture of desiccated cocoanuts. What are the uses to which this is put to and what are the by-products of this industry? (West Godavari District).

Raw-cocoanut after dehusking is deshelled. The deshelled cocoanut is skinned carefully to free it from the outer skin. The juice or cocoanut water from deskinned cocoanut is removed by puncturing the cocoanut. After this, the cocoanut is washed 3-4 times in running water. The washed cocoanut is grated into fine gratings in an electrically driven grating machine. The grated cocoanuts are then transferred on to a double-walled copper pan, the annular space of which is heated by means of steam. By suitable electrical arrangement, the pan is made to rotate 3-4 times per second and the drying operation is carried on for about 3 hours at a temperature of 160° F. (In this connection, it may be mentioned that this process is similar to that of making coated confectionery goods). The dried gratings are then transferred on to an inclined cooling table which is covered with tin plate. The product is allowed to cool there for about 12-18 hours during which time the oil that has exuded drains down and is collected in containers. The product which is now free from extra oil is then graded in a grading machine fitted with wire netting of the required mesh. The graded material is packed in tea chests of suitable sizes lined with aluminium foil and grease-proof paper. The product is now ready for the market. The product when soaked in water reconstitutes satisfactorily and resembles fresh cocoanut gratings.

Uses: Desiccated cocoanut is used in the manufacture of biscuits, confectionery, pastries, cakes and other food products. It finds application in many cooking preparations. It has a wide appeal for those who chew betel nut and pan.

India is importing considerable quantities of desiccated cocoanuts mainly from Ceylon.

This Industry yields very useful and important by-products, which are given below:

Cocoanut husk: After processing, the cocoanut husk yields (*a*) short fibres for making coir ropes and matting, (*b*) strong bristles which are used for making coir matting, (*c*) mattress fibre used in cushions and mattresses.

Cocoanut shell: Very high quality activated carbon which is largely used as a decolourising agent particulary in sugar industry is obtained from cocoanut shells. It may be mentioned that considerable quantities of activated carbon are being imported into the country. The shell, also yields during the process of manufacture of activated carbon large quantities of shell oil which can be used for the manufacture of disinfectants and synthetic resins.

The shavings are dried and oil is expelled therefrom yielding cocoanut oil as well as cocoanut cake both of which are very useful by-products.

Quality of prepared mustard

E (IS) 58

We had manufactured prepared mustard from ground mustard powder. This was bottled by us and marketed but after some weeks we received the product back along with the complaint that a sticky reddish brown coloured liquid was oozing out from the bottle and it may be noted that the bottles were closed at the mouth with plastic cap with waxed paper disc in the inside. We shall be highly obliged if you could let us know the reason of this liquid being formed and the necessary step to be taken to prevent the same. (Bombay)

Powdered mustard is very hygroscopic and picks up moisture from the air particularly under conditions when it is not hermetically sealed. The absorbed water dissolves the soluble starchy portion of the moisture and liberates oily fraction as has been noticed in your packs. The following procedure, if adopted, will be found very helpful.

Mustard for table use is a mixture of mustard flour, wheat flour, cayenne pepper, rape oil, common salt and turmeric in appropriate proportions. Two varieties of mustard seed *Sinapis alba* or yellow mustard and *Brassica nigra* or black mustard are commonly used. Equal quantities are taken and cleaned free from dust and sand particles. The clean mixture is crushed between rollers and then pounded in mortars. The powder obtained is sifted. The impure flour of mustard passes through the sieve and the dressing is left as residue on the sieve. A second sifting yields pure flour of mustard and a second quality of 'dressing'. The 'dressings' yield a mixed oil which is used for mixing with rape and other oils. A portion of the fixed oil is sometimes removed by hydraulic pressure to increase the storage life of the flour.

Cayenne pepper and turmeric are powdered. The ingredients are mixed well, passed through a fine sieve and bottled. A few recipes for the product are given below:

	I	II	III
Mustard flour lb ...	28	20	28
Wheat flour lb ...	28	16	20
Cayenne pepper lb ...	¾	½	⅝
Common salt lb ...	10	7	8
Rape oil lb ...	3	1½	2

Add turmeric sufficient to impart the desired colour.

Use of 'Vistanex' in chewing gum manufacture

E (IS) 59

We have been given to understand that 'Vistanex B-60' and 'Vistanex B-100' can be substituted for gum chicle which is an ingredient used in the manufacture of chewing gum. We would like to know from you whether use of Vistanex would in any way affect the quality of the finished product. (Shiyali).

As far as the use of VISTANEX B-60 and B-100 are concerned, we are also aware that they are being used in other countries, but do not know whether they are permissible under the Indian Food Laws. Therefore, we suggest that you may kindly address a letter in this line to the Secretary, Central Committee for Food Standards, Directorate-General of Health Services, New Delhi.

We are also not aware whether the import of VISTANEX is permissible at present. For this, you may kindly write to the Development Officer (Food), Ministry of Commerce and Industry, New Delhi.

Cold storage of vegetables

E (S) 60

We shall be thankful to you if you could supply information on the optimum conditions standardised at your Institute for the cold storage of tomatoes, cauliflower, cabbage and green peas. Let us also know the life of the various products. (Calcutta)

The information required by you is provided below:

Commodity	Optimum cold storage conditions		Approximate storage life
	Temp. °F	Relative humidity	
1. Tomatoes			
(*a*) green, mature	35-38	85-90	6 weeks
(*b*) yellow	42-45	,,	3 weeks
(*c*) red	42-45	,,	2 weeks
2. Cauliflower	32-35	,,	7 weeks
3. Cabbage	32-35	,,	2¾ months
4. Green peas	32-35	,,	2 weeks

Ill effects of cashew shell o (cardol)

E (S) 61

I saw a news item in a U.S magazine regarding the ill-effect experienced by a U.S. tourist as a result of consuming some cashew nu gathered in Ceylon. I would like to know whether cardol is present in the kernels and whether the above new item will not affect our export tra (New Delhi).

Cardol, which causes skin irritations and rashes, occurs mainly in the shells of the cashewnuts. The amount of cardol present in the kernels is so small as to be entirely harmless to human beings. We are exporting only chashew kernels to U.S.A. and other countries and whole cashewnuts are not exported at all. Therefore, the news item in a U.S. magazine describing the ill-effects experienced by an U.S. tourist as a result of gathering cashewnuts in Ceylon would not affect our export trade in this commodity.

Notes and News

STATISTICAL NOTES

Statement showing the productwise figures of exports for the month of March 1958 from Calcutta, Bombay and Madras ports

Description of fruit products	Total quantity in tons	Total value in Rs.
1. Mango chutney	57.1000	1,19,350
2. Canned fruits ...	9.5500	25,703
3. Canned vegetables ...	6.00 0	10,932
4. Dry fruits ...	0.22 0	946
5. Sauce ...	0.25 0	528
6. Assorted pickles	0.1500	731
7 Curry powder and paste ...	78.6050	1,85,285
8. Pickles ...	34.6050	67,266
9. Syrups ...	1.8500	1,681
Grand Total	188.3320	4,12,422

Monthly Marketing Notes, April 1958, issued by The Agricultural Marketing Adviser to the Government of India, New Delhi

NEWS BRIEFS

Colour of dough in semolina products: With semolina products as well as bakery products, the colour of the dough is affected by lipoxydase. However, whilst oxidation through lipoxydase is generally a slow process of diastasic reaction, that of semolina dough is a rapid process which may take place within a few minutes. The conversion of semolina promotes the initial phase of the destruction of the pigments. Enzymatic destruction is greater with particles of smaller grain size. To some extent, the final colour of the dough can be predicted from an investigation of lipoxydase activity (*Food Manuf.*, February 1958, p. 77).

Stunning by carbon dioxide: Carbon dioxide is a stunning agent which has the effect of reducing the sensitivity of the nerve cells and their connections (synapses). A mixture of 70 per cent CO_2 and 30 per cent air does not irritate the pigs but causes them to lose consciousness after 15 seconds. Consciousness returns 2 minutes after the animals are restored to normal air. The carcases of pigs slaughtered after stunning with not more than 70 per cent CO_2 have normal properties and keeping quality. The *p*H value is normal and more constant than after electric stunning. The method is more economic and has a number of other advantages. It is used mainly in U.S.A., Denmark, Sweden and Holland (*Food Manuf.*, March 1958, p. 116).

Improved sterilized concentrated milk: A new process for producing an improved concentrated sterilized milk, a canned product which will maintain its fresh milk characteristics for several months with or without refrigeration, it is claimed, has been perfected by research workers at the University of Wisconsin. The concentrated milk can be made in dairy plants with processing equipment now on the market. Production on a commercial scale, however, will require the development of factory-size equipment for canning the new type product. Costs of processing, it is said, should be comparable to costs of making evaporated milk.

For the housewife, it was pointed out, the new product offers several advantages. It can be used in the same way that cream is used on cereals and desserts, or as a beverage, depending upon the amount of water added. In sealed cans it requires only a third as much cupboard or refrigerator space as bottled fluid milk.

For dairymen the new product means broader markets because concentrated milk can be shipped long distances and can be marketed entirely through grocery channels as other canned foods now are. This could substantially reduce marketing and distribution costs.

University of Wisconsin officials said that they plan to make the patent covering the process a public one. The Wisconsin Alumni Research Foundation is handling all the patent arrangements as a service to the University and the inventors (*Food*, January 1958, p. 16).

Thaw indicator for frozen food industry: A new divice, called 'Freez-Chex' which consists of a combination of chemicals which act as a thaw indicator, has been developed by Aseptic-Thermo indicator Company. Freez-Chex, utilizing several chemicals in a polythene bag, will indicate if a frozen product has exceeded certain temperature ranges long enough to cause spoilage. The chemicals change colour when they reach a certain temperature. Samples of the new device have been distributed to several frozen food packers to obtain their reactions to its performance.

The detecting device can be placed in a carton just before it enters the quick freeze chamber. If the carton later is exposed to temperatures above a preset maximum the colour of the indicators change from yellow to red. Different formulas can be used to indicate the different temperatures required for different types of food (*Food*, January 1958, p. 16).

Radiation sterilization of apples: A process for the preservation of sliced apples by the use of radiation sterilization techniques is described in a new report by the U.S. Government. The report details research conducted at the University of Illinois for the Quartermaster Food and Container Institute for the Armed Forces.

Test results showed that mature apples were a better raw material than immature apples for the radiation treatment. Processing of the apples immediately after harvest was found to be a better procedure than allowing them to ripen by storage at 75° F. before processing. Blanching the slices in dilute sugar solutions with or without the presence of calcium gluconate and freezing proved superior to deaerating in chemical solutions.

Irradiation of the sample in the frozen state proved superior to irradiation in the non-frozen state (34° F.). The organoleptic acceptability of the apples was greater when irradiated at 0.5×10^6 rep rather than 1×10^6 rep. Under these conditions the product was still acceptable after six months of storage at 75°F. Based on the investigation, recommendations on the processing treatments and conditions are given (*Food*, January 1958, p. 21).

Puff-dried milk: A process of evaporating water from a liquid under high vacuum, producing a sponge-like structure many times the volume of the original liquid, was developed several years ago by one of the laboratories of the U.S. Department of Agriculture for concentrating orange juice. Having adapted the process to the drying of milk, scientists at the Eastern Regional Research Laboratory, Philadelphia, Pa., claim that the product disperses in water within 50 seconds and retains the flavour and quality of whole milk better than spray-dried or roller-dried milk.

Nitrogen is entrained in milk that has been concentrated to 47-50 per cent solids in a high vacuum falling film evaporator and heated to 135°F. Then the concentrate is homogenised, flowed over drying pans, cooled to 55°F. and vacuum-dried as a foam that can be reduced to powder by light crushing (*Food Trade Rev.*, January 1958, p. 25).

World cocoa production: The statistical committee of the FAO Cocoa Study Group has now forecast a 1957/58 world cocoa bean crop of 811,000 metric tons, 10 per cent smaller than the 902,000 tons revised estimate of the 1956/57 crop and 28,000 tons smaller than the crop in 1955/56. The crop in Ghana is forecast at 230,000 metric tons, 38,000 tons lower than last year due primarily to current wet weather which is delaying harvesting and threatening heavy losses from black-pod. The crop in Nigeria and the Cameroons is forecast at 107,000 tons, 30,000 tons smaller than last year. The Brazilian crop is forecast at 150,000 tons, or 11,000 tons smaller than a year ago. Crops in French West Africa and the French Cameroons are forecast at 63,000 and 55,000 metric tons, or 9,000 and 8,000 metric tons respectively smaller than a year ago.

The Committee forecasts world absorption of raw cocoa during 1958 at 802,000 metric tons, about 9 per cent smaller than the 884,000 metric ton revised estimate of 1957 absorption, but virtually the same as the 804,000 tons absorbed in 1956. The smaller anticipated consumption of cocoa in Europe and North America is due primarily to the much higher price level at which cocoa beans are now selling as compared with prices during the first half of the year, while the decreased grind in South America is due almost entirely to the expectation that Brazil will process a much smaller proportion of her bean crop during 1958 than during the past season (*Food Trade Review*, January 1958, p. 30).

By-products of passion fruit: In the extraction of juice from passion fruit about two-thirds of the bulk is at present wasted. About nine-tenths of this waste material consists of rind, and about one-tenth seeds. The whole of this is normally regarded as useless refuse.

Some work reported in the American Journal of Agriculture and Food Chemistry indicates that both the rind and the seeds have some potential value as a foodstuff for cattle. The authors point out that the rind contains about 4½ per cent of crude protein and quite a high proportion of carbohydrate, comparing well with pineapple bran which is used as a feed for dairy animals in Hawaii. Dehydrated passion fruit rind was found to be palatable to cows, all of which thrived on a ration containing 22 per cent passion fruit rind.

It was found that the rind could be dehydrated easily; no pretreatment with lime was needed in spite of the high percentage of pectin which it contained. Dehydration is not considered to be essential provided that some other method of preservation can be adopted. Ensilage is suggested as a possibility.

A useful oil can be extracted from passion fruit seeds; they are washed, air dried, crushed or ground, and put through an oil press. The oil can be used as a food; it compares favourably with cotton seed oil for this purpose (*Food Industries S. Africa*, April 1958, p. 19).

Fat enriched soyabean meal: Standard fat-enriched, dehulled soyabean meal is a new feed ingredient being produced by Standard Seed and Fertilizer, Inc. It consists of 20 per cent stabilized animal fats and 80 per cent dehulled (50 per cent protein) solvent extracted soyabean oil meal. It is a dry, dust-free, golden-coloured grain product packed in 100 lb. burlap sacks, containing 20 per cent fat and 40 per cent protein, this low-fibre, high-energy ingredient is designed for use in the latest formulations (*J. Agric. Fd. Chem.*, February 1958, p. 144).

NEW INDIAN STANDARDS

Maida: *Maida* is manufactured in roller flour mills, the largest use being in domestic spheres and in the preparation of Indian sweetmeats. It is also used in the making of bread, different types of biscuits, pastries and a number of other bakery products.

The quality of *maida* depends largely on the type of wheat as well as the milling technique employed, different qualities of *maida* being required for different purposes. For example, in the making of breads and certain varieties of biscuits, *maida* with a gluten content of 10 to 12 per cent is required, while for cakes, pastries, Indian sweetmeats, biscuits of certain other varieties, etc., the gluten content should not be so high.

The Indian Standard Specification for *Maida* (IS:1009-1957), prepared with a view to catering to varying needs, covers two grades of the material. The standard also envisages the enrichment of *maida* with calcium carbonate, iron, thiamine, riboflavin and niacin.

It prescribes requirements and methods of test for gluten, moisture, granularity, total ash, acid insoluble ash and crude fibre, and also limits for water soluble and alcohol soluble acidity with a view to ensuring the freshness of the material (*ISI Bull.*, March 1958, p. 96).

Maize starch: The two Indian Standard Specifications, one for Edible Maize Starch (IS: 1005-1957) and the other for Custard Powder (IS: 1007-1957), specify requirements and methods of test for moisture, total ash, acid insoluble ash, etc., and also the methods for packing and marking.

Edible maize starch (corn flour) is widely used in the country for the preparation of Indian sweetmeats like *halwa*, *gulabjaman*, *phirni* etc. It serves as a thickener in soup and gravy. It also finds use in the manufacture of biscuits, confectionery, baking powder, cosmetics and as a binding and diluting agent in the manufacture of pharmaceutical products such as pills and tablets.

Custard powder is a by-product of edible maize starch and often contains small quantities of other edible starches obtained from tapioca, arrowroot, potato or jowar (*Sorghum vulgare*) and to which suitable colouring and flavouring agents are added. Some brands of custard powder also contain egg and/or milk solids (*ISI. Bull.*, March 1958, p. 97).

Pyrethrum extracts: Pyrethrum extracts, containing varying percentages of pyrethrins, are largely used in the control of insect pests of medical, agricultural and veterinary importance. Different percentages of pyrethrins are required for different purposes.

The Indian Standard Specification for Pyrethrum Extracts (IS: 1051-1957) therefore, stipulates the variations that are permitted in the nominal percentage, which has been left to be decided between the purchaser and the vendor according to the purpose for which the material will be utilized. The solvents used in extracting pyrethrum being of an inflammable nature, the lowest permissible flash point has been specified in this standard so as to reduce the risk of fire during handling and transport of the material. Since pyrethrum extracts are also used as aerosols, a maximum limit for matter insoluble in dichlore-difluoremethane has been prescribed, in addition, for the material suitable for use as an aerosol.

Apart from other essential physical and chemical requirements, it also specifies the mode of packing, marking and methods of test for the various requirements specified. Methods of sampling, based on statistical considerations, have also been given to ensure that the samples taken for testing truly represent the consignment (*ISI. Bull.*, March 1958, p. 97).

Arrowroot: Arrowroot starch (commonly known as 'arrowroot') is chiefly used as a food for invalids and infants. To a small extent, it is also employed in the manufacture of biscuits and in making puddings, cakes and Indian sweets.

The Indian Standard Specification for Arrowroot Starch (IS: 1006-1957), prescribes requirements for particle size, moisture content, total ash, acid insoluble ash and *p*H of aqueous extract. With a view to ensuring freedom from adulteration, the microscopic appearance of the starch has also been specified (*ISI. Bull.*, March 1958, p. 97).

PATENTS

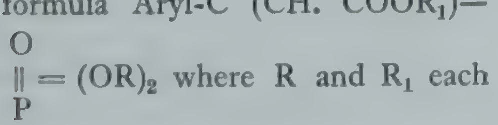
Indian

(A few of the Patent Applications notified as accepted in Part III, Section 2 of the Gazette of India from 4th January to 25th January 1958 are listed below):

57749. *Method for recovering urokinase from human urine:* Contacting urokinase with synthetic cation exchange resin containing substantial amount of carboxylic groups and eluting absorbate thus obtained with aqueous electrolyte.—Patented by K. Abildgaard-Elling.

57005. *Production of fatty acid mono- or di-esters of sucrose or raffinose:* Treating sucrose or raffinose with fatty acid ester of non-saccharide alcohol where said fatty acid has moiety of 6—30 carbon atoms.—Patented by Sugar Research Foundation, Inc.

57418. *Pest control compositions and a process for the preparation of the active principles therefor:* Carrier mixed with phosphoric acid of formula Aryl-C (CH. COOR$_1$)—



$$\text{Aryl-C (CH. COOR}_1\text{)}-\overset{\displaystyle O}{\underset{\displaystyle P}{\|}}=(OR)_2$$

where R and R$_1$ each are alkyl, aryl or aralkyl radicals.—Patented by Farbenfabriken Bayer Aktiengesellschaft.

60156. *A process for the simultaneous production of refined shark liver oil and vitamin A concentrates along with the recovery of other therapeutically active by-products:* Stearin is separated from the crude oil, which is then refined, the stearin fraction being saponified and the unsaponifiable matter being extracted with ether.—Patented by S. Mahdihassan, M. Moinuddin, S. M. Ali and S. A. Huq.

57616. *Disc for a device for extruding flour in paste form:* Outer rim provided with three movable arms, raised mid portion with holes on it, and the mid portion pressed down to form a conicular tube-like orifice.—Patented by S. Kulkarni.

57982. *Improvements in or relating to antibiotics:* Antibiotic E. 129 is produced by culturing *Streptomyces* E. 129 NCIB No. 8792, NRRI No. 2558 or a mutant thereof in a nutrient medium.—Patented by Glaxo Laboratories, Ltd.

59457. *A new process for preparation of fine dusts or wettable powders of insecticides such as DDT:* A molten mass of the insecticide is spray-atomised.—Patented by Council of Scientific and Industrial Research.

59975. *Process for producing aliphatic amino poly-carboxylic acids and their alkalimetal salts:* Carrying out reaction at temperature between 190°F and 250°F and using increased amount of alkali metal cyanide and formaldehyde-yielding substance in excess of theoretical requirement of each amino nitrogen of amine.—Patented by Refined Products Corporation.

61396. *Marking process for objects made of polythene or similar material:* Comprises the steps of oxidising the polythene surface and subsequently applying marking by pigment.—Patented by Standard Telephones and Cables Limited.

Foreign

784,545. *Preparing fish meal:* A process is claimed in which fish meal is prepared from fish or fish waste with the addition of quicklime or slaked lime. The amount which is added is sufficient to convert the hydrophilic protein material to a hydrophilic gel, the amount being not more than 10 per cent of the weight of the material used.

In an example of the process a batch of fish is loaded into a hopper and carried to the inlet of a mill by a conveyer belt. The material receives 5 per cent by weight of quicklime from a container with a controllable outlet value while it is on the conveyer. The mixture is ground down to pass through a 2-in. mesh, the resultant paste thus obtained being transferred to a drying yard, where it is spread out in thin layers and stirred once or twice to accelerate the drying. When dried it is ground to the required particle size.

Oil may be recovered from the fish by solvent extraction before the addition of the lime.

It is claimed that this method gives a light-coloured, pleasant-smelling product which is relatively cheap to produce.—Patented by Elias Picelin (*Food Manuf.*, February 1958, p. 86).

782,222. *Cereal composition for moist batters and doughs:* A reconstituted replacement for cereal flours in moist batters and doughs which will withstand starch liquefaction during storage periods contains essentially only an intimate admixture of dry, powdered wheat starch particles, free of diastatic enzymes, small and broken starch cells and mould spores, and a smaller proportion of dry, powdered undenatured gum gluten also free of diastatic enzymes and mould spores.

The prepared dough composition adapted to withstand starch liquefaction when maintained at a temperature of between 35° and 50°F, contains an admixture as before together with a relatively small amount of dried protein food product, a leavening ingredient and water equal to the volume of the ingredients in their dry state.

Natural cereal flours are 'washed out' to separate the starch and gluten, which is then mixed while excluding the introduction of bacteria and mould from the surrounding air. The water and other ingredients are added to make a composition which will withstand thinning and lessening of viscosity through liquefaction of starch during storage.—Patented by Pillsbury Mills, Inc. (*Food Manuf.*, February 1958, p. 86).

786,973. *Malt product preparation:* A malt product which may be used directly or with suitable mixings or coatings for human consumption is claimed. According to the invention, ungerminated barley or other cereal grain has the husks and other outer skins removed by the action of a solution of sulphuric acid at a concentration of 30 per cent or above by volume and at atmospheric temperature. Afterwards the acid is washed off along with the husks. The treated grain is then rubbed or stirred to remove the last of the husks before a final water rinse or, alternatively, a chemical wash to make sure that the acid is neutralised. Suspensions of calcium carbonate or solutions of alkalies in water are suitable for this purpose.

The grain is then soaked in water and allowed to germinate at a suitable temperature. After a selected period of growth, the grain is heated in order to remove the moisture and give it colour and flavour before being screened to remove the dried shoots and rootlets which have formed during germination.

The malt product obtained in this way may be used for human consumption or, alternatively, it may be ground alone or with malted or unmalted barley or other cereal or starch to provide a grist which may be extracted with hot water to provide a sweet beverage. This in turn may be boiled and fermented to provide a clear alcoholic beverage, largely free from the disadvantages associated with the formation of hazes.—Patented by Brewing Patents, Ltd., and J.R.A. Pollock (*Food Manuf.*, March 1958, p. 128).

785,795. *Food preservation:* A method of preserving food is claimed in which the food is enclosed in a bag or container after it has been cleaned or dressed. The bag, which must be made of flexible, waterproof and preferably transparent material, capable of withstanding cooking temperatures, is evacuated by removal of the gases and sealed, the package then being heated to a temperature not exceeding 100°C. The bag is held at that temperature long enough for the vegetative bacteria to be destroyed. After this it is cooled and stored at a temperature which will permit the development of any spores to vegetative bacteria, the said heating and storing steps being repeated until the food is effectively sterilised.

The quantity of the food placed in the container should not exceed 60 per cent of its maximum volume. The cooling may be performed rapidly by spraying the package with cold water or using some such method.—Patented by S. E. O. W. Erasmie and B. O. Schlyter (*Food Manuf.*, March 1958, p. 128).

785,713. *Carbonating apparatus for aerated water:* Apparatus for carbonating water and like liquids has a cylindrical carbonating chamber around which are wrapped two pipes extending throughout the whole length of the chamber and leaving no part of the wrapped surface exposed. One of the pipes conveys the water or other liquid to the chamber while the other is traversed by the refrigerant. The coils of the refrigerant pipe are metallically bonded to the wall of the chamber and also to the contiguous coils of the pipe carrying the water along continuous helical lines of contact.

It is claimed that the refrigerating capacity can be reduced and working pressure kept down by this arrangement, which cools the carbonating chamber as well as precooling the water.—Patented by D. C. Parr (*Food Manuf.*, March 1958, p. 128.)

2,813,032. *Antioxidant:* Sol-tion comprising edible oil, monoglyceride citrate, BHA, prop gallate.—Patented by Griffith La-ratories (*Food Engg.*, Febr 1958, p. 179).

2,813,796. *Quick-cooking ri* Made by steeping grain, cooki cooling, freezing, thawing, dr —Patented by Converted Rice, Inc Houston, Texas (*Food Engg.* February 1958, p. 179).

2,813,027. *Deodorizing fish:* B extracting with alcohol at pH or above.—Patented by Lever Bro Co., N.Y.C. (*Food Engg.*, Februar 1958, p. 179).

786,774. *Pastry glaze:* A baker' glaze for pastry, biscuits and bread comprises a mixture of milk, water an edible gum and a sugar: the edible gum is preferably gum arabic, the sugar preferably glucose, and milk in powdered form can be used.—Patented by R. Poulet (*Food Trade Rev.*, January 1958, p. 46).

787,127. *Sugar juices:* Relates to a method of clarifying sugar syrups and removing suspended impurities which normally occur in the processing of sugar beet and sugar cane juices: to precipitate the suspended impurities the juices are treated with a synthetic water-soluble polyelectrolyte, e.g., polymerisation products of unsaturated aliphatic carboxylic acids or salt-forming derivatives thereof.—Patented by Monsanto Chemical Company (*Food Trade Rev.*, January 1958, p. 46).

C.F.T.R.I. NEWS

The following distinguished personalities visited the Institute during June 1958:

Mr W. Block and Party, Representatives of Messrs. Larsen & Toubro, Bombay.

Mr Mital, Adviser to Government of India, Ministry of Community Development, New Delhi.

Dr G. B. Ramasharma, Biochemist, Rapatakos Brett & Co., Bombay.

Sri H. V. Kamath, Member of Rajya Sabha, New Delhi.

Mr Amrut V. Mody, Unichem Laboratories, Bombay.

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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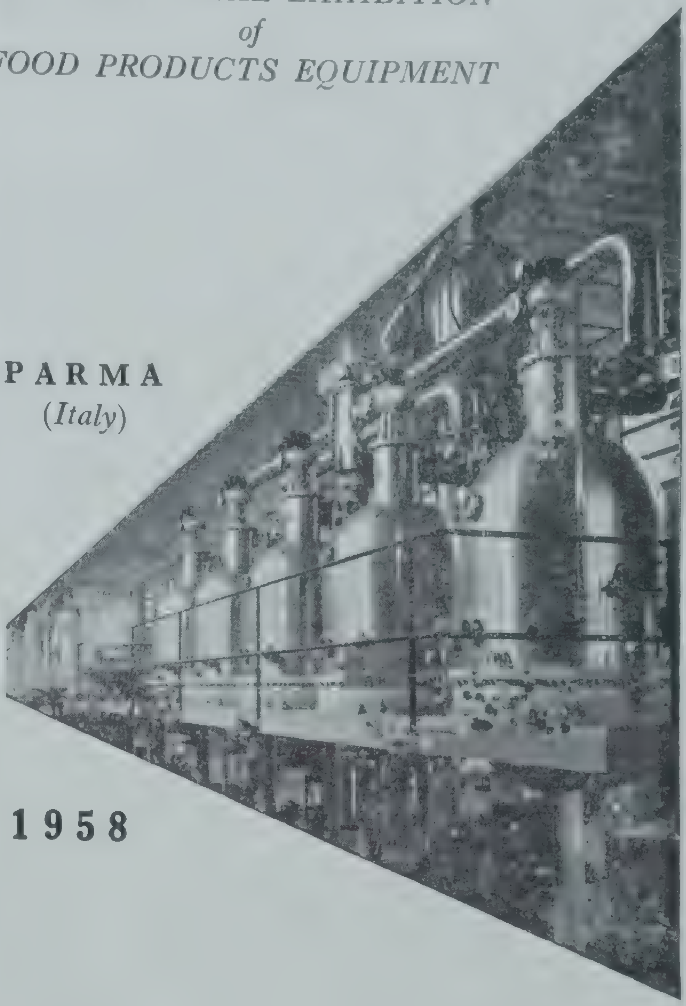
PARMA (*Italy*)
20th—30th September, 1958
Thirteenth **INTERNATIONAL FAIR** *for*
PRESERVED FOODS *and* **PACKING**
INTERNATIONAL EXHIBITION
of
FOOD PRODUCTS EQUIPMENT



PARMA
(*Italy*)

1958

The various DISPLAYS cover

MACHINERY and ACCESSORIES for producing and packing preserves, dairy produce, edible oils, bread and other cereal products, rice flour mill equipment, confectionery and cake and biscuit manufacture, bottling, wine trade, mineral water production, malting and brewing, cold storage, sugar refining.

SCIENTIFIC INSTRUMENTS and APPARATUS for the foregoing industries.

PACKING, CONTAINERS and ACCESSORIES for all the food industries.

PACKED FOODS—Vegetable, Animal, Fish, Milk Extracts and Soup Cubes, Fruit Juices and Syrups.

RAW MATERIALS for the food industries.

Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

Investigations on the medicinal properties of banana, by Subrahmanyan, V., *et al.*, *Ann. Biochem. exptl. Med.*, 1958, **17** (5), 155.—Banana is reported to possess therapeutic properties and much work has been done on this aspect by several workers. In the present study, the AA have determined the chemical composition of banana powder prepared from Poovan variety fruit generally recommended for medicinal use. The procedure for preparing the banana powder is described. Chemical analysis shows that the major components of the banana powder are sugars, starch, protein and citric acid. Nearly 9.3 per cent of the powder is unaccountable. The nutritive value of banana has been studied by feeding trials with rats. Inclusion of the banana powder in synthetic or rice diets produced a lower absorption of nitrogen while there was a three-fold increase in faecal weight. This might be due to the high fibre content in the banana. There was no statistically significant difference between the growth-promoting value of rats fed on the control synthetic diet and that with the inclusion of banana. The significance of the results have been discussed in the light of reports on the medicinal properties of banana.

K.L.R.

Colorimetric determination of vanillin, by Kapur, N. S., *et al.*, *Chem. and Ind.*, 1957, No. 38, 1272. —A colorimetric method for the estimation of small quantities of vanillin is described. This is based on the reaction of thiobarbituric acid with vanillin to produce a characteristic yellow coloured complex. The procedure is to add 0.025 M thiobarbituric acid (2 ml.) in M phosphoric acid to a vanillin solution, make up the final volume to 10 ml. and determine the absorption spectra of the coloured complex and optical density using a Beckman DU spectrophotometer. The complex has a characteristic absorption peak at 432 mμ—434 mμ irrespective of the concentration of phosphoric acid. The intensity of the colour at peak position is found to obey 'Beer's Law' and the optical density is directly related to the concentration of phosphoric acid in the reaction mixture. The method is successful in estimating as low an amount as 0.2 μg/ml. of vanillin and it can also be applied to several other aldehydes. The application of this method for estimating the amount of vanillin in foodstuffs such as biscuits and confectionery products is being investigated.

K.L.R.

Physico-chemical changes in jack fruit squash during storage, by Bhatia, B. S., Siddappa, G. S. and Girdhari Lal, *Indian J. agric. Sci.*, 1956, **26**, Part IV, 403.—A detailed study has been made of the changes in some physical and chemical characteristics of jack fruit squash during a storage period of about 60 weeks at room temperature (24-30°C), 37°C, and 2-5°C. Refractometer solids, *p*H and total titratable acidity remained unchanged throughout the storage period at all the temperatures. Reducing sugars and the degree of inversion increased during storage at all temperatures, the rate of increase being higher at 37°C than at room temperature or at 2-5°C. The total sugars, however, remained unchanged.

Temperature of storage is the most important single factor that influenced the retention of ascorbi acid in the squash. Irrespectiv of the level of fortification, th percentage retention during storage period of about 60 wee was 50-75 per cent at room temperature, 6-13 per cent at 37°C an 88-97 per cent at 2-5°C. The retention was more in sampl preserved with SO_2 than in thos preserved with sodium benzoat Deaeration, alone or combined wit nitrogen packing, did not much influence the retention values. There was no dehydroascorbic acid in the preserved squash.

At room temperature, only about one-third of the original added SO_2 (200 or 350 p.p.m.) remained in free form after 32 weeks of storage. At 37°C, the free SO_2 content was still less.

Samples stored at room temperature and 2-5°C retained their original colour during a storage period of about 60 weeks. At 37°C, however, considerable darkening of colour was noticed. Preservation with SO_2 affords the maximum protective action as regards colour change. Removal of air or packing under nitrogen gas did not show any advantage over the controls in checking deterioration in colour. There was comparatively greater darkening in squashes of higher Brix (56-62°) than in squash of lower Brix (44°). Addition of ascorbic acid increased the darkening of colour.

The squash retained its normal colour, characteristic fruit taste and aroma during the entire storage period of about 60 weeks at room temperature of 24-30°C and at 2-5°C. At 37°C, however, there was considerable deterioration in its quality.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Further studies with nadisan: Effect on blood cholesterol, blood glutathione and sugar tolerance in albino rats, by Mukherjee, S. K., De, U. N., and Mukerji, B., *Indian J. med. Res.*, 1958, **46** (2), 185.—Effect of nadisan feeding in different doses and period on blood cholesterol, blood glutathione (reduced) and sugar tolerance in albino rats has been studied. It has been observed that nadisan feeding (0.5 g./kg.) either in a single dose or in repeated doses does not alter the cholesterol or glutathione (reducing) level of blood in albino rats. Sugar tolerance curves in nadisan fed animals are defective in the sense that peak value in all the nadisan-fed animals is much higher than that of normal and the return of the blood sugar to the pre-glucose level is much delayed.

Studies on D 860—Another new oral hypoglycemic sulfonamide, by Mukherjee, S. K. and De U. N., *Indian J. med. Res.*, 1958, **46** (2), 223.—Effect of D 860 (Rastinon) Hoechst, a hypoglycemic sulphonamide, on fasting blood sugar level, on glucose-tolerance test, on insulin sensitivity test and on cholesterol and glycogen level in lever, and cholesterol and glutathione levels in blood of albino rats has been studied. Oral administration of D 860 in three doses (0.25 g./kg., 0.5 g./kg. and 1 g./kg.) lowers the fasting blood sugar level. The maximum and prolonged hypoglycemia is produced by a dose of 0.5 g./kg. Administration of both single and repeated doses of D 860 cause a diabetic-like peak value in the glucose tolerance curve and delays the return of blood sugar to preglucose level within 5 hours. D 860 feeding increases the effect of insulin both in intensity and duration. Blood glutathione and cholesterol levels in D 860-fed animals remain normal. Slight increase in glycogen and cholesterol content of the liver is observed.

The problem of standardization of liver preparation. Isolation and estimation of some of the toxic constituents. Part I., by Dutta, S. K. and Bose, S., *Indian J. med. Res.*, 1958, **46** (2), 289.—Physico-chemical methods have been described for isolation of free histamine, tyramine, tryptamine (or 5-hydroxy-tryptamine) and a basic polypeptide as well as for their estimation in different types of liver preparations. These may be utilized for the estimation of any toxic amines present in conjugated form, after their dissociation by electrodialysis and subsequent isolation. Certain physiological properties of the toxic bodies have been discussed and it has been shown that their isolation from the liver preparation is essential for full evaluation.

Amino-acid composition of edible muscles, by Joshi, N. V., Barnabas, J. and Barnabas, T., *Indian J. med. Res.*, 1958, **46** (2), 345.—The amino acid make-up of the proteins of edible muscles of 10 representative animals, commonly used in Maharastra has been determined in this investigation. Circular paper chromatographic and microbiological assay methods have been employed to identify and estimate the various amino acids present in protein hydrolysates of the muscle samples. The amino acid composition calculated to 16 per cent nitrogen is given in a table. The percentages of moisture, total nitrogen and ash have also been reported. In general, the values for different amino-acids compare well with the values reported in literature for muscle tissues. The differences found in certain cases have been discussed. It has been found that the paper chromatographic methods compare favourably with microbiological methods, thus indicating that the former may also be equally useful for the routine estimation of amino acids. The protein of the edible muscles of indigenous animals investigated is of the finest nutritive quality equalling to that of beef, veal, pork, chicken and other common meats. The general pattern of distribution of the 16 amino acids in muscles from mammals, aves, reptiles, amphibia and fish is found to be almost similar. These findings suggest that the structure of proteins of voluntary muscles in different vertebrate animals is essentially the same.

K.L.R.

Trypsin inhibitors in Indian foodstuffs: Part V—Effect of raw double bean (*Faba vulgaris* M.) and double bean trypsin inhibitor on the growth of rats, by Kamala Sohonie, Usha Apte and Ambe, K. S., *J. sci. industr. Res.*, 1958, **17C** (3), 42.—The effect of feeding raw and autoclaved double beans, singly or supplemented with methionine, on the growth of young albino rats has been investigated. The growth of rats on these diets is compared with that of rats fed on a casein diet.

Raw double bean diet has a deleterious effect on the growth of rats whereas better growth was observed in animals fed autoclaved beans. Purified trypsin inhibitor fed at 0.265 per cent level of casein diet has no deleterious effect on the growth of rats.

Pharmacognosy of root and leaf of *Coccinia indica* Wight and Arn., by Bisht, B. S. and Nayar S. L., *J. sci. industr. Res.*, 1958, **17C** (3), 46.—The macroscopic and microscopic characters of the root and leaf of *Coccinia indica*, which is reputed to be effective in the treatment of diabetes, are described.

DAIRY PRODUCTS

Studies on the bacteriology of Egyptian soft cheeses. I. Isolation and identification of proteolytic micro-organisms, by Rakshy, S. E. S. E., *Indian J. Dairy Sci.*, 1958, **11** (1), 11.—Micro-organisms possessing the ability to cause milk proteolysis, were isolated from *Mish*, a popular Egyptian dairy product. The isolates were found to belong to the genera, *Bacillus* and *Micrococcus*. Such isolates were characterized and identified. It was proved that the enzyme was exo-cellular and partially adaptive.

A rapid platform test for differentiating cow and buffalo milk, by Ahmed Farid Munib, *Indian J. Dairy Sci.*, 1958, **11** (1) 29.—The alcohol test which is used in the dairy industry for assessing the stability of milk against heat treatment, can also be developed into a test for differentiating between cow and buffalo milk, and for detecting the temperature to which milk has been exposed.

As acidity plays an important role in the balance of soluble minerals in milk and so would influence the alcohol test, it was possible to stabilize the natural acidity of milk for a period of 24 hours through the addition of not more than 0.05 per cent formaldehyde (40 per cent) without any change in the expected results. This makes possible performing the above mentioned test any time within the first 24 hours of collecting the sample. The test in its simplest form consists in determining the amount of Ca^{++} required to be added to 100 ml. of milk in order to obtain a positive alcohol test. If it exceeds 10 mg. it is safe to consider the sample as cow milk. However, this test becomes valueless if the milk has been exposed to heat treatment. The alkaline earth metals could replace Ca in the forementioned test, with the required concentration running in proportion to the atomic weight.

As Ba possesses the highest atomic weight of the alkaline earth metals, a modified test was finally adopted using Ba instead of Ca. The high atomic weight of Ba allows for a large difference between the amounts required to give a positive alcohol test in cow and buffalo milk, even when the latter had been preheated to 182° F. This helps the detection of adulteration.

Another advantage of the new test is its application in detecting the heat treatment to which milk had been exposed to and the temperature used. More data need to be collected from different location of the country and during various seasons of the year.

Investigations in viscosity and detection of adulteration of milk, by Kulkarni P. S. and Dole K. K., *Indian J. Dairy Sci.*, 1958, **11** (1) 36.—The viscosity of whole milk decreased on dilution with water. A decrease of 20-22 per cent in buffalo milk and 15-18 per cent in cow milk was observed with 25 per cent of dilution with water. The ratios K = viscosity constant/total solids and K′ = viscosity constant/solids-not-fat, were practically constant for a milk of a particular species. With the help of the ratio K′ and the viscosity constant it was possible to calculate solids-not-fat of a milk sample and hence the degree of adulteration. The ratios K and K′ of milks of different species are worth investigating as they may prove to be a useful tool in the detection of adulteration of milk in the hands of the Public Analyst.

Fat globule size distribution of buffalo milk, by Whittlestone, W. G., *Indian J. Dairy Sci.*, 1958, **11** (1), 43.—In a series of 6 samples of buffalo milk drawn serially by hand, the fat content was shown to increase steadily from 4.1 per cent to 12.0 per cent. There was no trend in the size distribution pattern of the fat globules from the second to the sixth samples, while the first sample showed more large globules than did the remainder.

FRUIT AND VEGETABLE PRODUCTS

Nutritive value of vegetables: Effect of processing on protein, minerals and ascorbic acid contents, by Sawant, P. L. and Magar, N. G., *J. sci. industr. Res.*, 1958, **17A** (3), 144.—The effect of blanching and canning operations on the protein, minerals and ascorbic acid contents of four vegetables, *viz.*, brinjal (*Solanum melagena*), bitter gourd (*karela; Momordica charantia*); okra (*Abelmochus* lentus); and *parwal* (*Trich* *dioica*), has been investigated. all the nutrients, protein is the le affected and its retention is hig all the vegetables. The loss minerals was more during blanch than during canning. Blanch causes greater loss of ascorbic than canning.

Studies on bacteria causi spoilage of canned vegetabl Part II—Canned peas and cau flower, by Ayan Dutt, J. M. a Bose, A. N., *J. sci. industr. Re* **17C** (3), 51.—The nature of bacte responsible for the spoilage commercially canned peas a cauliflowers has been investigat The AA have isolated two types rod-shaped bacteria from cann cauliflower and one type fro canned peas. From a study of the morphological and biochemic characteristics, they were found resemble *B. polymyxa*, *B. subti* and *B. lentus* species of bacter Heat resistance experiments showe that the spores of *B. polymyxa* a *B. lentus* could be destroyed 121.1°C in less than a minute a those of *B. subtilis* in 2 minute Because of the low heat resistance o *B. polymyxa* and *B. lentus*, the presence in the spoilt cans is diffi cult to explain if normal cannin procedures have been followed. I may, therefore, be presumed th their presence may be due to under processing or they might have bee 'breathed into' the can with wate during cooling.

K.I.R.

Polyploidy and vitamin C in *Emblica officinalis* **Gaertn,** b Janaki Ammal, E. K. and Sundar Raghavan, R., *Proc. Indian Ac Sci.*, 1958, **47** (5), 312.—*Em* *officinalis* Gaertn. is widely grow throughout India and also in oth Asian countries. It grows wild a is also cultivated. Variation in size of fruit has been found between wild and cultivated forms o *Emblica officinalis*. The AA h studied the chromosome number of the plants with a view to seeing whether there was any difference between the small, medium and large fruited types. The lowest chromosome number was 2n= 98 and was therefore a much higher polyploid than the one reported by Perry which is a tetraploid 2n=28. The chromosome number varied from 98-104 in cultivated forms which had larger fruits. The ascorbic acid contents of small, medium and large fruits were determined and the values were 411.6, 872.3 and 900.1 mg. per cent respectively. This shows that the ascorbic acid content is directly proportional to the size of the fruit. For a given number of fruits, vitamin C content is greatest in the largest form and least in the small one. When the values are, however, calculated in terms of percentages, then the fruits of the smallest size have the lowest vitamin C content whereas, there is no significant variation between the medium and the larger sized fruits.

K.L.R.

MICROBIOLOGY

A report on the yeasts from Kanji, by Gouri Rani Ghosh, *Sci. & Cult.*, 1958, 23 (10), 557.—Out of 21 isolates of yeasts obtained from *torani* which is the medium used for preparing Kanji, eleven have been identified and a preliminary report is given in this note. Four of the cultures have been identified as *Hansenula anomala* (Hansen) H. et. P. Sydow var. Ciferri (Lodder) et. V. Rij., one was found to be identical with *Candida guilliermondii* (Cast) Langeron et. Guerra var. *membranaefaciens* Lodder et. V. Rij. and three resembled *Candida tropicalis* (Cast) Berkhout species. The remaining three cultures studied were not yeasts but have been identified as *Geotrichum candidum* (=Oospora lactis). The characteristics of these groups of cultures are given.

K.L.R.

Comparison of adsorptive properties of yeast invertase on suitable adsorbents, by Biswas, M. M., *J. Indian chem. Soc., Ind. & New Ed.*, 1957, **20** (2), 99.—Comparative studies have been made for the adsorptive properties of yeast invertase on adsorbents like activated alumina gel, bentonite, colloidal kaolin and activated charcoal. Yeast invertase is found to be most efficiently adsorbed on activated alumina gel and the eluted extract affords the maximum invertase activity.

OILS AND FATS

The component fatty acids from the seed fat of ***Caesalpinia digyna***, by Gupta, D. K., Iyengar, B. T. R., and Chakrabarty, M. M., *J. Indian chem. Soc., Ind. & New. Ed.*, 1957, **20** (2), 112.—The component fatty acids from the seed fat of *C. digyna* have been examined by ultraviolet absorption and low-temperature crystallisation techniques as also by other usual methods. The fatty acids comprise 0.62 per cent myristic, 20.42 per cent palmitic, 8.24 per cent stearic, 1.4 per cent arachidic, 0.19 per cent behenic, 30.25 per cent oleic, 37.12 per cent linoleic, 1.68 per cent linolenic acids and non-saponifiables amount to 0.13 per cent.

Utilization of wastes from vanaspati factories. Part I—Reclamation of oil, nickel and filter aids from spent catalyst, by Sharma, B. G., Bhatnagar, R. K. and Kuloor, N. R., *Res. & Ind.*, 1958, **3** (2), 29.—The demand for nickel by the vanaspati, electroplating and metal finishing industries is steadily increasing; vanaspati industry alone consumes 275 tons of nickel formate annually. In view of the fact that India has no nickel resources of her own and there is at present an acute shortage of the metal in the country, it is important that nickel should be recovered from waste catalysts, electrolytic baths, etc., and reused.

In this article an efficient and economic method is described for the recovery of nickel, oil and filter aids from spent catalyst in the vanaspati factories. The recovery of oil is effected by extracting the spent catalyst with benzene-ethanol mixture. Nickel is recovered by extraction of oil-free residue with dilute sulphuric acid. The residue after the extraction of nickel salts consists mainly of filter aids, which after washing and drying, can be re-used. Nickel salts obtained can be put to many commercial applications without further chemical treatment.

Utilization of wastes from vanaspati factories. Part II—Recovery of bleaching earth and oil from filterpress-mud, by Sethuraman, V., *et al.*, *Res. & Ind.*, 1958, **3** (3), 57.—The bleaching efficiency of activated earths used for refining vegetable and animal oils depends upon the characteristics of the original earth (bentonite, fullers' earth, etc.) used for their manufacture. Only a few sources of raw materials, which can yield high grade bleaching earths, comparable to imported products are known to exist in India.

The paper describes a process which makes it possible to reclaim and reactivate repeatedly bleaching earth from the filterpress-mud of vanaspati and allied oil industries. The process consists in extracting the oil from the filterpress-mud using a benzene-ethanol azeotrope mixture followed by the activation of oil-free residue by calcination at 500°C. for 10-30 min. The bleaching efficiency of the reclaimed earth compares favourably even after repeated reclamations with that of the original earth.

Storage studies of groundnut oil. Part I—Effect of filter pressing on the keeping qualities of raw oil and the effect of storage on refining characteristics, by Thirumala Rao, S. D., *et al.*, *Indian Oilseeds J.*, 1958, **2** (2), 99.—Data on the effect of filter-pressing on the keeping quality of groundnut oil and on the effect of storage of groundnut oil on its refining characteristics are presented.

Unfiltered groundnut oils developed less amount of peroxide rancidity than the corresponding filter-pressed oils, though F.F.A.s in both cases are of the same order. An explanation is suggested for the lesser peroxide rancidity in the unfiltered oils in storage as due to the presence of the seed meal which is shown by earlier workers to contain some anti-oxygenic compounds.

No marked differences in the refining characteristics of groundnut oil on storage for 180 days are observed.

Storage studies of groundnuts at room and constant low temperatures, by Thirumala Rao, S. D. and Murti, K. S., *Indian Oilseeds J.* 1958, **2** (2), 112.—Pods and kernels of the same variety (Coromandel) were stored for a period of 1 year at the laboratory room temperature and at constant low temperature (40° ± 2° F.).

Samples were drawn periodically and analysed for moisture and oil content and the oils obtained from these by hydraulic pressing were analysed for F.F.A., refinability and peroxide values. The colour of crude and refined oils were also determined and the data presented.

Oil content of the samples stored for one year under different conditions are found constant.

Samples in cold storage kept much better than those stored at room temperature and both the pods and kernels stored at low temperature remained prime.

The groundnuts with an initial moisture content of about 4 per cent were not spoiled even on a storage at room temperature for one year whereas the kernels stored under the same condition began to deteriorate even after a period of about 2½ months.

A note on the effect of frying Indian sweetmeats on the constants of ghee, by Mitra, S. N., Sen Gupta, P. N. and Mathew, T. V., *Sci. & Cult.*, 1958, 23 (10), 563.—The effect of frying sweetmeats made of pulses on the values and constants of *ghee* has been reported. The sweets such as *jilabi*, *amirti*, etc., were prepared with ground pulse (besan), a little flour and baking powder and they were fried in *ghee*. The sweets after frying were immersed in sugar syrup in the usual way. The butyro refractometer reading at 40°C, Reichert value and the saponification value were determined in the case of *ghee* left in the frying pan as well as *ghee* obtained from the prepared sweets by ether extraction. The results are compared with the values for original unburnt *ghee*. It is found that the Reichert value, which is the most important constant of *ghee* is altered, though only to a small extent, both in the fat left after frying and that extracted from the sweets. It decreases from 28 to 27 in the case of *ghee* extracted from the sweets. Saponification value also diminises slightly as is expected. It is suggested that both the Reichert and Saponification values of the fat extracted from the sweets could be used as indices to assess the purity and quality of the original *ghee* used in the preparation of these sweets.

K.L.R.

GENERAL

Activated charcoal fr groundnut hull. Part III—Co parative study of activated c bon from groundnut hull a teak wood sawdust, by Narasim Rao, T. L. and Datar, D. S., *J. Ind chem. Soc., Ind. & News Ed.*, 19 **20** (2), 75.—Comparative studies activated carbon prepared fr groundnut hull and teak sawdust have been made. Te have been conducted for ca decolourisation, bleaching of veg able oils and adsorption of meth lene blue, iodine and vapours organic liquids.

Studies in carbohydrates, Pa VII. Investigation of Bael fr (*Aegle marmelos*) mucilage, Parikh, V. M., Ingle, T. R. a Bhide, B. V., *J. Indian chem. S* 1958, **34** (2), 125.—The mucila obtained as a white powder fr *Aegle marmelos* has been investig ted and found to be non-reduci in character, optically active a possessing no acetyl or metho group. It shows positive tests galactan and pentosan. The hydr lysate of the mucilage shows th presence of galactose, arabino and a trace of methylpentose Methylated mucilage on hydrolys has yielded four sugars, two which forming the major part, hav been identified as 2.3:4:6-tetra-*o* methyl-and 4:6 di-*o*-methyl-D galactose. Chemical and physic characteristics have been studie with a view to ascertaining th structure of the mucilage.

PART III (Foreign)

ANALYTICAL

Lipoxidase activity by cup-plate techniques, by Blain, J. A. and Todd, J. P., *J. Sci. Fd. Agric.*, 1958, **9** (4), 235.—Conditions for the assay of soya lipoxidase by cup-plate techniques have been examined using a linoleate-carotenoid system. Observations have also been made on the activity of wheat extracts and haematin compounds on the system. It is considered that a valid estimation of lipoxidase can be made on soya extracts, but not necessarily on extracts of other plant materials.

Two-dimensional paper-chromatography of higher fatty acids, by Michalec, C., *Biochim. Biophys. Acta*, 1958, **28** (1), 212.—Earlier methods for the chromatographic separation of long chain fatty acids reported in the literature are not successful in producing individual spots. The A. has developed a two-dimensional chromatographic method wherein the separation is effected at the laboratory as well as lower temperatures. The method has been successfully tried with a synthetic mixture of higher fatty acids and also with human blood serum. The method consists in impregnating Whatman No. 3 paper with a solution of 5 per cent paraffin oil in ether, spotting the sample on the paper and carrying out the ascending chromatography with 93 per cent acetic acid as mobile phase in the first run. The temperature was maintained at about 20°C during the 5-hour development and the chromatogram was dried at 80—90°C. The second was run at—8° C for 16-20 hr. with a mixture of 85 per cent formic acid—acetic acid—water (50:50:5 by volume) as solvent. The separated compounds were identified with cupric acetate and potassium ferrocyanide or with mercuric acetate and diphenylcarbazone. The method of isolation of fatty acids from blood serum has been described.

K.L.R.

ANTIOXIDANT

Trihydroxybutyrophenone — a food grade antioxidant, by Stuckey, B. N. and Gearhart, W. M., *Food Tech.*, 1957, **11** (12) 676.—2, 4, 5-Trihydroxybutyrophenone, a food grade antioxidant, was compared with butylated hydroxyanisole, butylated hydroxytoluene, and propyl gallate. In edible fats, it was shown to produce initial stability equal to propyl gallate but had little or no carry-through properties in baked goods. It was found to be extremely active in vitamin A, yellow grease and paraffin wax.

Antioxidant in malt and malt sprouts, by Baker, D. L. and Hellman, N. N., *Food Tech.* 1958, **12** (1), 33.—Flours prepared from malt and malt sprouts, when added to fats or oils, inhibited the accumulation of peroxides upon aeration or oxygenation. Methanol extracts of malt sprouts showed enhanced antioxidant activity. Preliminary trials suggest usefulness of malt flour as a natural wholesome food ingredient to contribute antioxidant stabilizing the flavour of food products prepared with oil or fat.

BIOCHEMISTRY AND NUTRITION

Role of cation in the dephosphorylation of phosphoproteins by alkali, by Sundararajan, T. A., Sampath Kumar, K. S. V. and Sarma, P. S., *Biochim. Biophys. Acta*, 1958, **28** (1), 148.—It has been observed that alkalis differ widely in their ability to dephosphorylate phosphoproteins. The hydroxides of calcium, strontium and barium were thus much more effective as dephosphorylating agents, compared with those of sodium and potassium. Ammonia, which was ineffective by itself, readily dephosphorylated phosvitin in the presence of certain metal ions. It is concluded from these studies that the dephosphorylation of phosphoproteins is catalysed by metal ion and that the dephosphorylating action of an alkali on phosphoprotein is influenced to a large extent by the nature of the cation present in it.

Dephosphorylation studies carried out on different phosphoprotein substrates indicate the presence in these of phosphate grouping resistant to dephosphorylations. Several explanations have been offered to account for this observation.

Phosphoprotein fraction obtained from tissues by SCHEIDER'S procedure has been shown to resemble other phosphoproteins in its dephosphorylation behaviour towards alkali and enzyme.

An improved procedure for the preparation of alkali-dephosphorylated casein, which involves the use of dilute barium hydroxide as dephosphorylating agent, and a chemical method for the preparation of a phosphopeptone from casein, have been described.

CEREALS

Effectiveness of sorbic acid in preservation of damp wheat, by Pomeranz, Y., *Food Res.*, **22** (6), 553.—The use of sorbic acid as a fungistatic agent for preventing the deterioration of damp wheat has been examined by the A. who has conducted experiments on the U.S. hard red winter sample with a moisture content of 12.5 per cent and protein content of 12.4 per cent. An addition of sorbic acid at a level of 0.2 per cent completely inhibits the fungal growth on mould-innoculated wheat. The mould development on damp wheat is also inhibited by sorbic acid to a considerable extent, while the growth of micro-organisms is inhibited to a large extent. However, sorbic acid treated grain shows germ discolouration accompanied by the reduction of seed viability. This prevents sorbic acid from being used for grains which may be utilized for malt production and seedling purposes. The effects of sorbic acid on the flour yield, loaf-volume potentialities of the flour, dough characteristics, etc., are also discussed.

B.V.S.

CONFECTIONERY

The influence of sugar in vanilla ice cream. I. Consumer preferences, by Pangborn, R. M., *et al.*, *Food Tech.*, 1957, **11** (12), 679.—Over 6,000 consumers evaluated vanilla ice cream containing 11, 13, 15, 17, or 19 per cent sugar, by paired comparison-preference. Results showed that the 3 higher levels were liked equally well but were preferred to a significant degree over the 11 and 13 per cent sugar levels. Neither environmental temperature nor body size seemed to influence sweetness preferences. Males showed more decided preferences as a group than females. The two age groups of 16 to 25 and 25 to 50 showed more discrimination than younger or older consumers. People who consumed ice cream several times a week had more decided preferences than those who ate the food less frequently. By all methods of classification of the data, the sample containing 11 per cent sucrose was least often preferred.

Retrogradation in a starch jelly candy, by Sterling, C., *Food Res.*, 1957, **22** (2), 184.—With a view to evaluating the extent of retrogradation (i.e., crystallization) in a starch jelly candy with time, results of application of various measures of crystallinity (including cold water solubility, X-ray diffraction, opacity, iodine sorption, and enzymatic digestion) to a starch jel of known rheological properties are presented. Most methods clearly showed an increase of crystallinity with time, but the rate of increase differed among them. Aging brought about no changes in the lattice dimension of the polysaccharide crystal, certain other properties of the older jel have also been discussed.

J.S.P.

FISH

Studies on the North Sea cod. II—Deoxyribose nucleic acid in the musculature, by Love, R. M., *J. Sci. Fd. Agric.*, 1958, **9** (4), 199.—Deoxyribose nucleic acid (DNA) was determined in the flesh of cod of different sizes, in different parts of the fillets, and in myotomes and myocomma tissue. Much more D.N.A. was found in myocommata than in myotomes, owing to the higher density of nuclei in the former.

The pattern of D.N.A. concentration in different parts of the fillet was in inverse relationship to the fibre sizes. This was explainable in terms of the number of fibres contained in unit volume.

In fish of increasing size, the D.N.A. was not in inverse proportion to the increase in fibre size, although it did decrease somewhat. This was considered to be the result of D.N.A. synthesis in the larger cod.

In fish of constant size, observed over a period of two years, the D.N.A. concentration stayed roughly constant over most of the year, but showed increases during certain summer months. A proven explanation was not possible, but the increase was thought to be connected with growth.

FLAVOUR

Incorporation of natural fruit flavours into fruit juice powders II. Concentration and locking of concord grape flavours, by Dinmick, K. P., *et al.*, *Food Tech.*, 1957, **11** (12), 662.—The volatile flavouring component of concord grape juice was recovered, concentrated, and locked by an experimental procedure. Steps included (1) recovery of flavouring constituents by flash vaporization and rectification, (2) concentration by distillation with a 40-bubble-plate-type column, (3) further concentration by extraction with iso-pentane, addition of rice oil or sesame oil as an extender, and removal of the iso-pentane by distillation, and (4) locking of the non-aqueous flavour concentrate in sorbitol or a sugar mixture. No alteration in flavour resulted from concentration of the flavouring component by distillation up to 330-fold. Locked product improved the flavour of reconstituted grape juice powder, giving juice a more pleasing and natural aroma. Chemical analyses showed low recovery of methyl anthranilate in the first step and low retention of total volatile esters in the last two steps. However, important unidentified flavouring constituents probably came through the process with a better yield.

FRUIT AND VEGETABLE PRODUCTS

Time-temperature tolerance of frozen foods. X. Retail packs of frozen red raspberries, by Guadagni, D. J., *et al.*, *Food Tech.*, 1957, **11** (12), 633.—Sixteen individual lots of commercially packed frozen raspberries, obtained during 4 seasons, were evaluated by means of subjective (colour and flavour) and objective tests. Trained laboratory panels found highly significant flavour differences in approximately 90 per cent of these lots within 2 weeks at 20° F. Preferences of the trained tasters and a large group of untrained laboratory tasters were, however, about evenly divided between 20° F. control and stored samples even after 6 weeks of storage at 20° F. Evidence is given to support the hypothesis tha principal reason for ease of sele the stored from control sam the migration of acidity from ber to sirup and not necessarily the d lopment of objectionable flav Most of the frozen-food q control experts who exam samples held at 20° F. for va periods indicated that berries h at this temperature for 6 would not result in consumer com plaint. It is emphasized, how that other fruits such as peac and strawberries would be seri damaged under these conditio It is of utmost importance t distribution practices be patterne to the requirements of the mo sensitive commodities. Time r quired for approximately the san degree of colour and flavour chang was found to vary exponential with temperature over the 10 30° F. range, and the time require for an equivalent change w increased 2- to 3-fold for each 5° F reduction in temperature. Colou and total acid ratios were found t give good indication of the temper ture history of froznen raspberrie The soluble-solids ratio was foun to be particularly useful as a thaw ing indicator. Storage under vari ous time-temperature condition indicated that colour, flavour, an ascorbic acid changes are additiv and that the degree of change is th direct result of the sum of all th time-temperature experiences which the product may have encountered.

Relation of acidity to variation in browning of canned grape fruit sections during storage, by Huggart, R. L., Wenze F. W. and Moore, E. L., *Fo Tech.*, 1957, **11** (12), 638.—Th relation between some chemical or physical properties of canne grapefruit sections and can-to-can variation in darkening or brownin which occurs after long periods o storage under usual comm conditions was studied. Co total acidity, soluble solids (°Bri Brix acid ratio, pH, ascorbic aci drained weight, headspace vacuum were determined for ndividual cans of grapefruit section rom several commercial packs. Cans of sections obtained from a commercial plant every 2 weeks hroughout a packing season were examined after being stored for 6 months at 90° F.; also examined were cans of 2 packs that had been stored in a commercial warehouse n Florida for 10 and 14 months, respectively. Commercially packed samples, in which the acid level was adjusted by the addition of small amounts of citric acid or sodium hydroxide, were also stored at 90° F. for 6 months and then checked. Results indicated that darkening of canned grapefruit sections during storage occurred more frequently in sections having a high acidity and low pH. Samples with a high Brix/acid ratio did not darken as much as those with a low ratio; however, at a given ratio, samples with lower acidity and lower soluble solids were better in colour. Overpacking of cans gave high drained weights, low vacuum, low headspace and resulted in a high acid level and poor colour. Degree of browning during storage of canned grapefruit sections did not correlate with ascorbic acid content of products.

The non-volatile organic acid of some berry fruits, by Whiting, G. C., *J. Sci. Fd. Agric.*, 1958, **9** (4), 244.—The organic acids of a number of berry fruits (soft fruits) have been examined qualitatively and quantitatively using the methods of paper chromatography, silicagel partition chromatography and ion exchange. In black-currant, red-currant, white-currant, loganberry, raspberry, strawberry and elderberry, the predominant acid was citric acid, with smaller amounts of malic acid; in blackberry, malic acid was predominant with large amounts of lactoisocitric acid and isocitric acid also present. Gooseberry was examined at stages during growth; shikimic acid was the dominant acid in very young fruits, later citric and malic acids predominated. Both shikimic and quinic acids were detected in gooseberry, blackberry and elderberry.

Quantitative aspects of strawberry pigment degradation, by Livingston, G. E. and Fellers, C. R., *Food Res.*, 1957, **22** (2), 117. —The degradation of the anthocyanin primarily responsible for the red colour of strawberries has been studied in pure pigment solutions. The effects of several factors like temperature, time, pH, oxygen, ascorbic acid, 5-hydroxymethyl-2-furaldehyde, and various potential stabilizers on the rate of degradation of this pigment have been investigated quantitatively. The kinetics of the degradation of pelargonidin-3-monoglucoside were studied in buffer solutions at pH 2.0 and 3.4. Under exclusion of oxygen and in the temperature range from 45° to 110°C, first-order reaction rates and straight thermal destruction-time lines were obtained. A tentative scheme for this pigment's degradation is proposed. The effects of 19 different additives were tested on colour retention in strawberry juice and buffered pigment solutions. Only thiourea, propyl gallate, and quercetin showed some beneficial effects on both juice and pigment.

J.S.P.

Nutrient composition of Cuban foods II. Foods of vegetable origin, by Navia, J. M. *et al.*, *Food Res.*, 1957, **22** (2), 131.—Results of chemical analysis of 137 samples of foods of vegetable origin, collected from various parts of Cuba during 1954 are presented. The foods covered are several fruits, vegetables, cereals, legumes and oleagenous seeds.

J.S.P.

After-cooking discolouration of potatoes: Possible involvement of polyphenolic constituents, by Hunter, A. S., *et al.*, *Food Res.*, 1957, **22** (6), 648.—After-cooking discolouration of potatoes occurring either as greying or as blackening at the stem and just beneath the skin is met with in all kinds of domestic or processed potato-products. The AA have used 12 samples of potatoes with differing degrees of blackening and have tried (1) to isolate as many polyphenolic constituents as possible from extracts of the tissue (2) to examine the number as well as relative amounts of several polyphenols and (3) to estimate the chlorogenic acid content of differing discoloured potatoes. Separation and estimation of polyphenols have been done using two-dimensional paper-chromatography.

The polyphenols were found to be concentrated in the stem and just beneath the skin. The discoloured ones, however, were not found to have a greater variety of polyphenols or a higher concentration of chlorogenic acid than those of the normal ones. The tendency towards blackening was not proportional to the concentration of polyphenols and chlorogenic acid in the potatoes.

B.V.S.

Enzymatic action and off-flavour in frozen peas, by Wagenkneckt, A. C. and Lee, F. A., *Food Res.*, 1958, **23** (1), 25.—Enzymes like catalase and peroxidase cause the development of off-flavour in raw and underblanched vegetables during frozen storage. The AA have reported here about the production of off-flavours during the frozen storage of macerates of blanched peas brought about by the addition of enzymes—*catalase*, *peroxidase*, *lipoxidase* and *lipase*. They have also made a correlated chemical study of lipid deterioration.

The development of off-flavour and colour was determined by a taste-panel evaluation, after storage for 3 months and again for 17 months at -17.8°C. The addition of enzymes caused the off-flavours in frozen storage. The lipoxidase treated samples showed a moderate off-flavour while the lipase treated ones exhibited disagreeable flavour. All the four enzymes effectively changed the green colour of the peas indicating the loss of chlorophyll. The addition of lipase and lipoxidase resulted in the deterioration of lipids. The role that lipase possibly plays in the development of off-flavour is also suggested.

B.V.S.

MEAT

Relative efficacy of three tetracyclines with poultry meat, by Wells, F. E., *et al.*, *Food Tech.*, 1957, **11** (12), 656.—Three antibiotics—tetracycline, oxytetracycline, and chlortetracycline were compared at 4 storage temperatures for their ability to extend the shelf life of poultry meat. Chickens were killed, scalded at 140° F. (60° C) for 40 seconds, mechanically picked, eviserated and chilled. After chilling and prior to packaging they were treated by immersion in a solution of 10 p.p.m. of the respective antibiotic for 15 minutes. Packaging was done by placing in a cardboard tray and then placing the tray in a polyethylene bag. Storage was accomplished by placing the packaged chickens in coolers held at 0°C., 3°C., 9°C., and 12°C. Spoilage was determined by observing for microbial growth, development of slime, and development of odour. Half birds were used—4 halves for each treatment at each storage temperature. Three replications were made. In addition one series was treated at a commercial processing, plant to compare the results obtained there with the results from the University plant. Chlortetracycline was found to be the most effective at all temperature levels, although at the two higher temperatures, differences were small. Effectiveness of all antibiotics was greatest at the lower temperatures. Predominant types of microflora present at the time of spoilage were isolated. Types found on the untreated birds agreed with published findings. A number of the birds treated with the antibiotics were spoiled due to the growth of yeasts, especially at the lower temperature ranges.

Antibiotic treatment of crab and oyster meats, by Benarde, M.A., and Littleford, R. A., *Appl. Microbiol.*, 1957, **5** (6), 368.—The results herein reported tend to support observations made in our laboratory during the past 2 years that crabmeat of high quality loses this quality during the first 6 to 8 days storage. Crabmeat kept beyond this time lacks the strong typical flavour; a flatness becomes evident though the meat is still quite edible. Spoilage occurs shortly after the 'flat' stage, from 10 to 15 days after storage at 1°C.

Chemical treatment with antibiotics as reported here have not been able to extend the storage life presently attainable with untreated meat.

Decreased bacterial counts have been obtained with antibiotic treatments in some instances, but this treatment does not extend the length of fresh storage.

Similarly with oysters, antibiotic treatment has been able to reduce the total viable aerobic population, but the storage life was not increased beyond that of the untreated samples.

From the data obtained, the conclusion seems unavoidable that antibiotics as employed in this study were unable to extend the useful storage life of crab and oyster meats.

Combined irradiation—heat processing of canned foods—I. Cooked ground beef inoculated with *Clostridium botulinum* spores, by Kempe, L. L., *et al.*, *Appl. Microbiol.*, 1957, **5**, 292.—Irradiation alone is not sufficient to inactivate completely the botulinus toxins, most enzymes and pathogenic vines and anaerobic bacterial spores, but a synergistic action of gamma radiation and heat had been found to be advantageous. Ground beef packed in No. 1 picnic tin cans and inoculated with *Clostridium botulinum* 213B spores was sterilized by combined irradiation-heat processing. The canned meat was irradiated in centre well of the large cobalt-60 gamma radiation source and subsequently heated at 180°F. Using 5,000,000 spores per can, an F_0 of more than 0.6 was required to produce sterility following 1.0 mega rep of gamma radiation; with 300 such spores per can, an F_0 of less than 0.2 was sufficient for this purpose after the same amount of radiation. Without pre-irradiation F_0 values of approximately 1.0 a 4.0 were required in the first second instances, respectively. irradiation with less than mega rep of gamma radiation not appreciably reduce the F_0 subsequently required in instance

R. F. J.

MICROBIOLOGY

Observations on the heat de truction of spores of *Baci Cereus*, by Vas, K. and Proszt, *J. appl. Bact.*, 1957, **21** (3), 431 The heat destruction curve, at of spores of *Bacillus cereus* is sho not to be logarithmic. This fact the cause of the apparent incre in the value of the decimal reductu time as calculated by the method Stumbo *et al.* (1950).

Experimental results suggest t the order of death of bacteria no mally observed may best be e plained by a variation (possibly an approximately log-normal typ of resistances of individuals in t population.

A minute and fairly constar fraction (1 in 10^7 or 10^8) of th spores possessed extreme heat re sistance. This fraction consiste of cells which formed part of th natural distribution of resistanc and not of cells which had arisen b mutation. Descendants of spor surviving extreme heat treatment did not show increased he tolerance.

The influence of moisture and temperature on the destruction of *Cl. Botulinum* in acid bread by Ingram, M. and Handford, P. M. *J. appl. Bact.*, 1957, **20** (3), 442.—The destruction of *Cl. botulinum* in special bread at pH 4.8, an equilibrium relative humidity (e.r.h.) 94 per cent or 97 per cent initially and a temperature of 25° or 37 was studied. Under all these conditions, the number of spo fell steadily during storage for 6 months. At the end of this time, survivals reckoned on the number initially inoculated were: at 37° and 97 per cent e.r.h., 6-12 per cent at 37° and 94 per cent e.r.h., 10-22 per cent; at 25° and 97 per cent

.r.h., 55-68 per cent and at 25° nd 94 per cent e.r.h., 33-54 er cent. Corresponding differ- nces were noticed throughout e storage period. The differences etween survivals at the two tem- eratures were highly significant tatistically; those between survivals t the two humidities were not.

Weight changes in the bread amples indicated that the e.r.h. f the bread became progressively ower during storage. The pH id not change appreciably.

In a control experiment, consi- erable multiplication was observed vhen the pH of the bread was djusted to 7·7 and its e.r.h. to 8.5 per cent.

Sorbic acid as a selective gent in cucumber fermenta- ions II. Effect of sorbic acid on he yeast and lactic acid fer- mentations in brined cucum- bers, by Costilow, R. N., *et al.*, *Appl. Microbiol*, 1957, 5 (6), 373.—The results of a 3-year study of the effect of sorbic acid on microbiological activity in cucumber fermentations are presented. This study involved 121 experimental cucumber fermentations distributed among 11 different locations in the northern cucumber production area.

Sorbic acid proved to be a very effective inhibitor of yeast activity in cucumber fermentations. All levels tested from 0.01 to 0.10 per cent were very inhibitory. However, some yeast activity, both subsurface and film-forming developed in the fermentations treated at the 0.01 per cent level and occasionally with the 0.02 per cent treatment. Small populations of yeasts were noted in some samples from fermentations treated with sorbic acid levels of 0.025, 0.03, 0.05, and 0.1 per cent, but they were too low to constitute a significant fermentation.

Lactic acid fermentation was inhibited by 0.1 per cent sorbic acid treatments when the initial brine strengths ranged from 20° to 40° salometer; also, it was inhibited by 0.05 per cent sorbic acid with initial brining at 40° salometer. When 0.03 per cent levels or less were used, no significant effect on the acid development was noted.

The sorbic acid levels as measured spectrophotometrically were always lower after equalization than calculated in the treatment. While it was shown that fairly large errors may occur in measurement, this does not account for the consistently low measured concentrations. No explanation for this is available at this time.

Rapid techniques in industrial microbiology, 1, by Charlett, S. M., *Food Manuf.*, 1958, **33** (4), 137.—A number of simple techniques for the rapid examination as well as assessment of the bacteriological quality of the machinery and materials is dealt with in detail. The instruments, the media, the oilnents, sampling techniques and the method of determining bacterial numbers are elaborated upon, to enable the industrial microbiologist determine the bacteriological quality of various materials at short notice.

B.V.S.

Rapid techniques in industrial microbiology, 2, by Charlett, S. M., *Food Manuf.*, 1958, **33** (5), 137.—In the second and concluding part of his article, the author discusses the merits and demerits of the three methods, *viz.*, direct microscopic count, the Frost little-plate method for counting viable bacterial numbers and the dye-reduction methods for measuring the *bacterial activity*. The stain formulae are also given. The little-plate technique is considered valuable in the quality testing of comparatively perishable products. The author concludes that none of the procedures described here is recommended as a substitute for the more normal bacteriological methods.

B.V.S.

SPICES

Chemical evaluation of the pungency of onion and garlic by the content of volatile reducing substances, by Lionel Farber. *Food Tech.*, 1957, 11 (12), 621.—Applicability of the volatile reducing substances (VRS) procedure to quantitative evaluation of the pungency of onion and garlic has been illustrated. Aeration time, concentration of sample and of the alkaline potassium permanganate oxidizing reagent all affected amount of VRS recovered from various onion and garlic preparations; each of these will have to be established, however, to suit particular experimental conditions. Boiling aqueous extracts of dehydrated onion and garlic markedly decreased characteristic odors and the VRS contents. Presence of added sulphur dioxide of 25 p.p.m., or even lower concentrations, could be detected by the increase in the reduction of the permanganate by acidified over that of nonacidified samples.

TEA

The phenolic substances of manufactured tea. II.—Their origin an enzymic oxidation products in fermentation, by Roberts, E. A. H., *J. Sci. Fd. Agric.*, 1958, 9 (4), 212.—The brown acidic pigments and the yellow neutral pigments of black tea are provisionally named therubigins and theaflavins respectively. These and other substances characteristic of black tea are formed during the fermentation process, mainly as the result of the enzymic oxidation of (-) -epigallocatechin and (-) -epigallocatechin gallate. It is probable that the theaflavins are intermediates in therubigin formation.

The phenolic substances of manufactured tea. III. Ultraviolet and visible absorption spectra, by Roberts, E.A.H. and Williams, D. M., *J. Sci. Fd. Agric.*, 1958, 9 (4), 217.—The absorption spectra of thearabigin fractions are all very similar and differ appreciably from those of the theaflavins. Theaflavin and theaflavin gallate have similar absorption spectra, which also resemble that of purpurogallin. Substances A, B and C have absorption bands at 275 mμ. The spectrum of Q differs from that of purpurogallincarboxylic acid

The identification of P as a $5{:}7{:}3'{:}4'{:}5'$-pentahydroxyflavylium salt is suggested. Substance 1C absorbs similarly to gallic acid, and the presumed *p*-coumaryl-quinic acids to *p*-coumaric acid.

GENERAL

Preservation of apple cider with sodium sorbate, by Weaver, E. A., *et al.*, *Food Tech.*, 1957, **11** (12), 667.—Sodium sorbate preserved commercially prepared apple cider for 7 days at a storage temperature of 70—75°F., and for more than 105 days at 50°F., or lower. Sodium sorbate imparts no objectionable off-flavour to apple cider as does sodium benzoate. Sodium sorbate controlled yeasts and molds, but was not effective against bacteria at high storage temperatures. When high bacterial numbers were encountered, sodium sorbate was metabolized and reduced below its effective concentration. Measures which helped to control bacterial growth in cider, such as mild refrigeration or addition of bisulfite greatly increased the effectiveness of sodium sorbate.

Analysis of the carbohydrates of *Cladostephus sp.*, by Fanshawe, R. S. and Percival, E., *J. Sci. Fd. Agric.*, 1958, **9** (4), 241.—*Cladostephus verticillatus*, a brown seaweed belonging to the genus *Cladostephaceae*, was collected from Nobska Point, La Jolla, California, during 1955 and air-dried. Alcoholic, aqueous, and sodium carbonate extracts have been analysed. The major carbohydrates are alginic acid, laminarin, fucoidin and mannitol. Quantitative estimations of the fucoidin and laminarin content (2 per cent and 20 per cent of dried weed, respectively) of *Cladostephus spongiosus* collected near Plymouth have also been carried out.

Studies on the non-enzymatic browning of foods—Organic acid amino model systems, by Bhatia, B. S., *et al.*, *Food Res.*, 1957, **22** (3), 266.—Browning in organic acid—amino acid model systems involving 11 organic acids and 20 amino acids has shown that the ultra-violet peak of the brown precursors is generally at $275\ m\mu$. The amino acids containing S-S- or -SH- linkage (cystine and cysteine) did not develop brown precursors during a 10 week storage period at 55°C. The amino acids containing an indole ring or phenolic group (tryptophan or tyrosine) induce browning faster than other amino acids.

Pyruvic and maleic acids seem to retard the browning reaction in organic acid-amino acid systems.

J.S.P.

The interaction of polyphenols and proteins during cacao curing, by Forsyth, W. G. C., *et al.*, *J. Sci. Fd. Agric.*, 1958, **9** (3) 181.—The solubility and activity of the glycosidase, oxidase and proteinase enzymes in acetone-washed powders prepared from samples of c beans taken throughout a comm cial curing have been determin The enzymes, and indeed all proteins, are rendered insoluble phenolic tanning immedia following the death of the bean. T relevance of this reaction to quality of the processed bean discussed. The enzymes, altho insoluble. remain active but at mu reduced rates. The necessity slow drying becomes apparent wh the degree of inactivation a immobilization of the enzyme realised.

Observations on 'crude fib estimation by acid digestion, Dougall, H. W., *J. Sci. Fd. Ag* 1958, **9** (1), 1.—The solvent act of 0.255 N-, 1.5N-, 3N- and 6 sulphuric acid on Kikuyu gr and Rhodes grass 'feed' and 'faece and of 1.5N-sulphuric acid Russian comfrey, *Setaria splendi* and *Trifolium semipilosum* has be studied. Equations have be derived to relate the 'crude fib remaining after acid digestion to t concentration of the acid and to t duration of the boiling. Exper mental results are discussed in t light of Hallsworth's suggestion th the 'crude fibre' in animal feedi stuffs might best be determined an acid digestion for 1 hr. with eith 5 or 7·5 per cent sulphuric aci The extraction of fats from t feeding stuffs beforehand, and t estimation of the nitrogen contain in the residues resisting acid diges tion, are proposed.

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STUDIES ON THE PREPARATION AND PRESERVATION OF 'RASAGOLLAS'

By W. B. Date, Y. S. Lewis, D. S. Johar and D. S. Bhatia

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Among the Indian sweets that are popular hroughout India, Rasagolla—essentially a Bengali weet—occupies an important place. This is eing marketed in retail as a fresh product nd sold both loose and in tins. The canned roduct has been reported to be very much nferior to the fresh ones both in quality and ppearance, and in several cases, there have been nstances of microbial spoilage. No systematic tudy of the problems involved in the preparation nd preservation of Rasagollas has been reported ven though Haldar[1] recommended the need for uch studies on the premise that this commodity as an export possibility. The only literature vailable relates to '*channa*' which is the first tage product in the preparation of Rasagolla. avies[2] has given an account of the '*channa*' ndustry in Bengal and De and Ray[3] have reported heir studies on the method of '*channa*' making.

The technique of making Rasagollas is an art y itself and, therefore, the success in getting a ood quality product is dependent entirely on he experience of the confectioner. The investigations carried out at this Institute included not nly the study of the process employed by the Rasagolla industry but also to explore ways and means of improving the quality of the product.

OOD SCIENCE AUGUST 1958

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The problems associated with the Rasagolla industry are primarily of the nature of:

(*i*) Prevention of microbial spoilage, which is particularly noticed in cans having sugar syrup below 45° Brix.

(*ii*) Preservation of the crispness and porous texture of the product during storage and

(*iii*) Prevention of browning of solids which occurs during storage of the product particularly under high temperature conditions.

Milk, as it is available in India at most of the places, carries heavy microbial load and similarly, practically all sugars sold in the country carry microbial load as reported by Johar[4]. It is, therefore, necessary that these two principal raw materials should be free from their inherent contaminations as far as possible. Further, it has been observed that heat processing of canned Rasagollas packed in heavy sugar syrup not only offers considerable difficulties in obtaining the proper temperature at the centre of the can during exhausting but also brings about increased browning of the Rasagollas and to some extent also the loss in crisp texture.

It was, therefore, considered necessary that a canning procedure which will offer a commercially sterile product will suit the requirements of the industry. In that direction studies were undertaken on the use of clean milk boiled enough to destroy the microbial load and a well clarified syrup made out of good quality sugar. Syrup having a Brix strength that would plasmolyse bacterial cells and would not allow them to multiply was used. Thus the experiments undertaken were aimed at reducing the microbial loads of milk and sugar and preserving the crisp texture and attractive white colour of Rasagollas.

Experimental

The general outlines of the technique of preparing and packing Rasagollas as adopted by the industry are as follows:

Milk (generally cow's only) is brought to a boil and curdled by adding an adequate quantity of whey. It is then filtered by pouring on to a mull cloth and the curd collected cooled by immersing the mull bag in cold water. When sufficiently cooled, the bag is taken out and the excess fluid gently squeezed. The sweet curd—called '*channa*'—is then well kneaded to a creamy consistency and made into small balls which are immediately boiled in a previously clarified sugar syrup of 60° Brix for 20-30 minutes. Rasagollas, as these balls after cooking are called, are filled in sterilized cans and the inter-space filled with a thin syrup of 35-40° Brix. The filled cans are immediately seam closed or soldered and then processed in boiling water for half an hour. These are subsequently cooled under tap water.

(*a*) *Studies with commercial packs of different treatments:* The first lot of samples as received from a commercial concern in Calcutta was prepared in the usual way and packed in solder top cans. On cut-out examinations of the product, it was found that some of the cans had a positive pressure. The product in general had an off-flavour and in some cases even it had distinctly sour smell. These observations relating to various cut-out tests can be summarised as follows:

Solid to syrup ratio—3:2.
Vacuum and/or pressure in cans—+12″ to —12″.
Colour of the product—white.
Aroma—a few cans showed unpleasant odour.
Brix of syrup—42-44.°
Acidity of syrup (no. of c.c. of 0.1 N NaOH required to neutralise 100 c.c. of syrup) —2.4-4.8.

In the second lot, open top plain cans of A2½ size were used. The cans after being filled with Rasagollas and high sugar syrup were exhausted in boiling water for half an hour during which the centre of the can recorded a temperature of 160-165° F and were then seam closed. Three different lots with various conditions of proce
i.e. (*i*) at 10 lb. steam pressure for 30
(*ii*) at 15 lb. steam pressure for 15 minutes
(*iii*) at 15 lb. steam pressure for 30 min
were made for subsequent studies. Each o
them was cooled in running cold water b
storage.

Immediately after these lots were rece
from Calcutta (lapse of 2 weeks), a few cans
examined for initial data. Of the remai
cans, half the number was left at the
temperature (25-30°C) and another half at 3
At the end of a storage period of 6 months,
product was examined becteriologically, ph
chemically and organoleptically. It was obse
that the Rasagollas in the cans had turned br
and also lost their crisp texture. In the abs
of any standard method for judging the cr
of Rasagollas, and finding during the cour
this investigation that a good correlation e
between the crispness and the per cent
soluble protein (which is taken as a measur
the extent of denaturation of protein),
solubility of the proteins in 5 per cent N
solution was taken as an index of the loss
crispness of the product. The observat
made (each on one canned sample) on the eff
of processing and storage temperature on
various characteristics of Rasagollas are give
Table I.

(*b*) *Experimental packs under comme
conditions:* Based on the observations mad
respect of the two lots of canned Rasagol
detailed experiments were planned to study
effect of using different precipitants such as w
and 2 per cent citric acid solution and also differe
processing conditions such as 10 pounds ste
pressure for 30 minutes, and 15 pounds ste
pressure for 15 minutes, in relation to
commonly practised technique of using whey a
precipitant and processing in boiling water
half an hour (which was employed as control).

For these trial packs, only one pound pl
butter cans were used though in commer
packing both one pound butter and A2½ si
plain cans are generally used. The selection
temperature and time of processing used in t
investigation was based on the analogy of t
product to other non-acid canned foods.

TABLE I. *Effect of processing and storage temperature on the various characteristics of canned Rasagollas stored for 6 months*

Temp. of storage	Processing	Colour and flavour	Brix of syrup	No. of c.c. of N/10 alkali required to neutralise 100 c.c. of syrup	Vacuum in cans (inches)	Moisture in solids %	Total protein (N × 6.38) %	Salt sol. protein (N × 6.38) %	Salt sol. protein as % of total protein
Room storage 25 °C–30 °C	10 lb./30 min.	White colour, pleasant aroma	54	2.4	13	38.03	16.06	4.92	30.63
	15 lb./15 min.	do	52	2.8	14	39.40	14.39	6.23	43.29
	15 lb./30 min.	Slightly brown colour, pleasant aroma	56	2.8	8	34.70	14.09	6.09	43.22
In an incubator at 37 °C	10 lb./30 min.	Brown colour, cooked aroma	52	3.6	13	37.80	16.94	4.09	24.14
	15 lb./15 min.	do	56	3.2	7	34.84	15.00	3.37	22.46
	15 lb./30 min.	do	54	3.2	8	38.83	15.56	3.58	23.00

experimental lots of Rasagollas included in this study were prepared in collaboration with a large scale Rasagolla packing concern with a view to obtaining conditions as they exist in the industry. All the samples packed according to the above 5 treatments were brought to Mysore (this took about 10 days) and then stored at room temperature (25-30°C) and in an incubator (37° C). Periodical examination over a storage period of one year was carried out and the results obtained are given in Tables II, III, IV, V, and VI.

(*c*) *Experimental packs in the laboratory:*

(1) *Channa making:* (*i*) *Choice of precipitant:* According to De and Ray's report, *channa* made by using 1-2 per cent lactic acid solution was most suitable for the preparation of Rasagollas but in these trials, it was found that the acidity of the precipitant higher than 0.5 per cent (practically similar to that of whey) always resulted in the loss of creamy consistency of *channa* so that in all the subsequent packing trials, only 0.5 per cent lactic acid solution in the proportion of one part of acid solution to 6 parts of milk was used as the precipitant. Other steps in the preparation of Rasagollas were the same as followed by the industry.

(*ii*) *Possibility of using buffalo milk:* It has been reported by De and Ray[3] that buffalo milk

TABLE II. *Effect of storage and temperature on colour and flavour of the Rasagollas*

Treatment	Initial	3 months R.T.	3 months 37°C	6 months R.T.	6 months 37°C	12 months R.T.	12 months 37°C
1. Control ...	White, crispy no prominent flavour			Crispy, flavour good. Colour good	—	Slightly brown colour. Still acceptable	Off flavour quite brown
2. Treatment I ...	Slightly brown pleasant flavour cracked surface	Samples at 37°C have more marked cooked flavour and dark colour as compared to R.T. samples		Quite acceptable	Brown colour Rubbery texture	Slightly brown slight tough texture, acceptable	Dark brown, very tough, texture
3. Treatment II	,,			,,	,,	,,	,,
4. Treatment III	More brown, slightly tough texture, pleasant flavour			Slightly tough, texture, flavour good	,,	,, Brown, Rubbery texture	Very dark brown. Rubbery texture
5. Treatment IV	,,			,,	,,	,,	,,

TABLE III. *Effect of storage and temperature on the Brix reading of the syrup*

TREATMENT	Initial	3 months		6 months		12 months	
		R.T.	37°C	R.T.	37°C	R.T.	37°C
1. Control ...	49	49	...	51	...	45	43
2. Treatment I	50	50	50	51	50	49	49
3. Treatment II	50	49	50	52	50	49	49
4. Treatment III	50	49	49	50	50	48	49
5. Treatment IV	49	49	49	50	50	49	49

TABLE IV. *Effect of storage and temperature on the per cent acidity of syrup*

(No. of c.c. of N/10 NaOH required to neutralize 100 c.c. of the sugar syrup)

TREATMENT	Initial	3 months		6 months		12 months	
		R.T.	37°C	R.T.	37°C	R.T.	37°C
1. Control ...	2.0	2.4	...	3.2	...	5.6	29.6
2. Treatment I	2.2	2.4	2.8	2.4	2.8	2.8	4.0
3. Treatment II	2.2	2.8	2.8	2.8	2.8	2.2	4.4
4. Treatment III	2.8	4.0	4.0	2.8	4.0	4.0	5.6
5. Treatment IV	2.8	3.2	3.6	2.8	4.0	3.6	5.2

TABLE V. *Effect of storage and temperature on the vacuum in cans*

TREATMENT	Initial	3 months		6 months		12 months	
		R.T.	37°C	R.T.	37°C	R.T.	37°C
1. Control ...	9″	1″	...	6″	...	11″	4″
2. Treatment I	12″	9″	12″	11″	1″	10″	12″
3. Treatment II	12″	11″	11″	9″	12″	12″	12″
4. Treatment III	9″	7″	10″	3″	11″	11″	12″
5. Treatment IV	1″	13″	13″	13″	13″	14″	14″

is not suitable for *channa* making; it can, however, be used upto an admixture of 25 per cent with cow's milk without much detriment to the quality of the product. The hard texture of *channa* from buffalo milk is due to its high calcium content. Some experiments[7] were, therefore, made in which buffalo milk was treated with either a mixture of NaH_2PO_4 and Na_2HPO_4 (9 g. + 7 g.) or 0.1-0.2 per cent sodium citrate for every 25 lb. of milk. Treatment of the milk with these chemicals prior to making *channa* resulted in soft *channa*. The rasagollas made from the treated *channa* were quite soft.

(2) *Control of bacterial load:* (*i*) *By us* *chemicals:* Compounds like potassium me sulphite and sodium metabisulphite were on the basis of 100,250 and 500 p.p.m. of to either the boiling syrup or to *channa.* either case, it was observed that the R disintegrated during boiling and did not their compact round structure. In another with a few levels of SO_2 aimed at testing tolerance of a taster, it was found that above 50 p.p.m. was detectable by a majority.

(*ii*) *By use of essential oils:* In the conte the common practice of using either the essence or 'kewra' essence with this product Bose *et al*[5-6] report about the relative efficac essential oils as bacterioides and the geraniol major constituent of rose essence) having a h phenol co-efficient, a 10 per cent water emuls of geraniol using Tween 20 as emulsifier (2 cent) was added to Rasagolla packs in s quantities that the over-all geraniol concentrati in the product amounted to 0.025, 0.05, 0. 0.25 and 0.5 per cent.

It was found that concentrations of geran below 0.1 per cent were not effective bacterio gically. The product, however, had a v pleasant aroma when geraniol in the prod was 0.01 per cent. At all higher concentratio of geraniol, a distinct bitter taste was impart to the product.

(*iii*) *By the use of sulpha drugs:* A 2 per ce solution of sulphanilamide was added to Rasagol packs in different concentrations and its effe on the reduction of bacterial load was studied.

(*iv*) *By use of hydrogen peroxide:* This ch mical was added at 0.02 and 0.04 per cent to th milk and a contact period of 15 minutes w given before the milk was boiled and used fo *channa* preparation. The coagulation was ve timid, filtration and separation of whey were ve difficult. A very soft *channa* was obtained whi could not be used successfully for makin Rasagollas.

(3) *Retention of the texture of Rasagollas:* (*By use of softening agents:* It is known th Rasagollas harden and lose their soft and spong texture during storage. With a view to impr

TABLE VI. *Effect of storage and temperature on the quality of protein of Rasagollas*

ription of sample	Initial				3 months				6 months				12 months			
	Moisture %	Total protein on dry basis	Protein sol. in 5% NaCl on dry basis	Salt sol. protein as % of total protein	Moisture %	Total protein on dry basis	Protein sol. in 5% NaCl on dry basis	Salt sol. protein as % of total protein	Moisture %	Total protein on dry basis	Protein sol. in 5% NaCl on dry basis	Salt sol. protein as % of total protein	Moisture %	Total protein on dry basis	Protein sol. in 5% NaCl on dry basis	Salt sol. protein as % of total protein
								ROOM TEMPERATURE (25-30°C) SERIES								
ntrol ...	39.67	18.69	13.12	79.19	37.64	21.55	14.11	65.48	38.19	19.46	9.35	48.05	45.82	21.26	4.83	22.72
eatment I	38.31	19.37	6.38	32.93	35.44	21.51	5.99	27.85	37.61	22.04	4.44	20.15	39.29	18.74	3.98	21.24
atment II	37.68	22.16	8.38	37.84	36.43	22.01	7.40	33.62	36.88	23.25	...	...	39.85	19.71	4.41	22.38
atment III	38.90	19.21	7.31	38.06	34.94	23.74	7.28	30.67	35.68	24.05	1.89	7.85	36.15	22.40	3.33	18.72
atment IV	38.28	20.64	6.67	32.31	35.33	23.25	7.76	33.38	30.51	21.53	4.38	20.34	36.45	22.59	3.88	17.18
								37°C STORAGE SERIES								
eatment I	38.31	19.37	6.38	32.93	34.96	21.83	4.63	21.20	36.47	20.73	2.13	10.28	36.14	20.42	1.09	5.34
eatment II	37.68	22.16	8.38	37.84	35.54	22.83	5.64	24.71	37.60	18.85	2.36	12.51	36.11	22.49	1.17	5.20
eatment III	38.90	19.21	7.31	38.06	34.40	24.17	4.04	16.72	35.86	21.48	1.46	6.79	34.81	24.23	0.56	2.31
eatment IV	38.38	20.64	6.67	32.31	34.73	23.10	4.66	20.18	36.47	22.13	1.81	8.19	35.20	24.09	0.83	3.44

ng on the texture of Rasagollas from cow's milk dditions of certain softening agents were made o *channa* and Rasagollas made therefrom. It vas observed that addition of softening agents uch as Rochelle salt, trisodium phosphate, odium citrate, calgon either individually or in combination at levels ranging from 0.1 to 2.0 per cent resulted in the disintegration of Rasagollas during boiling and further work in this direction was discontinued.

(*ii*) *By boiling channa balls in sealed cans: Channa* balls were prepared by following the usual procedure and packed in syrup, leaving the usual headspace, and seamed. Three lots of cans were processed at 2½ lb. p.s.i. for 20, 40 and 60 minutes respectively. These lots were then cooled and cut open. It was observed that Rasagollas had not swollen at all and they were raw inside.

Discussion

From the results of the various experiments reported above, it will be observed that it is very difficult to get a good quality of channa from milk which has been sterilized either by heat or by a chemical like hydrogen peroxide. In either case the milk proteins lose some characteristic essential in the swelling of Rasagollas and retention of round shape during boiling.

Sterilization of sugar syrup also offers difficulties. Mere boiling of syrup is not enough to kill the bacterial spores. Though essential oils are reported to have good bactericidal properties, the levels at which these are effective impart bitter taste to the product. Addition of SO_2 to boiling syrup is undesirable as Rasagollas pick up that smell.

Sulpha drugs have shown promise in reducing the microbial load, but it would not be possible to recommend such an addition until our food laws allow the same.

The various cans of Rasagollas examined for bacteriological data could be classified broadly under four heads (1) commercial, (2) canned in the laboratory by a hot-pack-method, (3)

2

canned in the laboratory and autoclaved and (4) cans to which preservatives had been added.

Most of the commercial cans as put out in the market by confectioners were hand-soldered and the syrup was of low density. The contents of cans showing viable cells of yeast, bacteria and mold spores were found to be associated with the absence of any degree of vacuum, improper sealing and the low concentration of sugar (25-30° Brix). This was supported by the microscopic examination of the smears and platings on suitable media. Several of the cans also showed actual microbial spoilage such as souring, swelling and off-flavour development.

Cans, where the Rasagollas had been filled hot, exhausted in boiling water for ½ hour and then sealed, showed complete absence of yeasts, mold spores and vegetative cells of bacteria. However, spores of flat-sour organisms of the type *Bacillus stearothermophilus* and of a mesophilic aerobic organism were present. This was demonstrated by plating aliquots of the sugar syrup and solid material on dextrose tryptone agar and nutrient agar respectively. However, except in a few cases where souring was observed in cans containing low brix syrup (30-35°), there was no gross spoilage due to these organisms over the long periods of incubation—6 to 12 months. The vacuum (8-11″), high sugar concentration (50-55°Brix) and the heating before and after packing ensure absence of vegetative viable cells and the germination of spores during incubation.

Cans where the Rasagollas had been subjected to steam-pressure sterilization after filling, invariably showed absence of spores of flat-four organisms, but the very resistant spores of a mesophilic organism were still present. However, no gross spoilage was observed of any type, again because of the vacuum, sugar concentration and heat sterilization. The product was very unattractive because of browning and leathery texture. The higher purity with respect to organisms is hardly worth the sacrifice made in colour and texture.

The cans to which various preservatives such as SO_2 essential oils and sulpha drugs had been added showed presence of many organisms, unless the amounts added were so high that they imparted bitter and disagreeable tastes or in objectionably high concentrations.

Examination for other organisms such sulfide stinkers (*Clostridium nigrificans*) meso lic and thermophilic proteolytic anaerobes by using suitable media such as sulfite agar liver broth invariably gave negative results in the cans examined. These organisms can h be potential spoilage organisms for a produc this type where very little soluble nitroge available for the growth and the osmotic pre of sugar syrups is formidably high for survi growth.

Commercial sterility, without sacrificing qualities such as colour and texture, is attained for this product by the hot pack met of filling the cans with the hot product and sea while hot etc., as described in the other sectio This is the maximum of processing that the R gollas can stand. The higher sugar concent tion (50-55° Brix) although causing grad dehydration of the Rasagolla balls and mak them hard, seems a necessary evil which can be avoided.

Conclusion

The following procedure was found in laboratory to yield a satisfactory pack of product.

Use preferably cow's milk. Buffalo m adjusted to 4-5 per cent fat and treated w sodium citrate or phosphate mixture may be used. Lactic acid solution 0.5-0.75 per ce should be used for precipitating *channa*. B the milk for 5 minutes and allow it to cool about 10-15°F before the precipitant is adde Small lots of milk and precipitant are mix together and then immediately poured over t draining arrangement. *Channa* should be coo by washing in one or two changes of cold t water. The syrup to be used for boiling Ra gollas and packing should be made from a g quality white crystalline sugar. Syrup should clarified with milk. The Brix of the syrup f boiling and filling the cans should be 55-60° a 50-55° respectively. The *channa* balls should boiled for about 25-30 minutes. After boilin put the Rasagollas into the previously sterili cans and pour boiling hot syrup leaving a hea space of ¼″ (the filling syrup should be ke oiling for 30 minutes before pouring in the can). nmediately seam the cans and invert them and llow them to cool to room temperature. There is o further processing required in this procedure.

Acknowledgement

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THE EFFECT OF GARLIC ON CERTAIN INTESTINAL BACTERIA

Spices and aromatics such as, garlic, *ajowan*, lack pepper and asafoetida are being used xtensively in the Indian dietary. These are lso used in the Indian system of medicine for orrecting a variety of intestinal disorders[1]. arlic in particular has antibacterial properties nd is widely used both in intestinal disorders nd for a number of infectious diseases[2]. The ntibacterial activity of garlic has been shown to e due to the presence of allicin[3] which on *in itro* tests, has been found to inhibit the growth f a number of micro-organisms[3-4].

Subrahmanyan *et al*[5] studied the antibacterial ctivity of water extracts of a number of common pices on intestinal bacteria and reported that arlic was the most potent one. They also nvestigated the effect of incorporation of garlic in he diet on the intestinal microflora of rats and ound that garlic brought down considerably the umber of coliforms, anaerobes and total count n the ceca of rats fed either stock diet or poor South Indian diet containing high percentage of edgram *dhal*[6]. In view of the wide spread use f garlic in the Indian system of medicine for treating certain intestinal and other disorders, it was felt desirable to study the relative susceptibilities to garlic of different organisms, inhabiting the intestines in health and disease.

The surface of garlic bulbs was sterilised by dipping the bulbs in alcohol and burning it. The sterilised bulbs were macerated well with 15 ml. of sterile water and centrifuged. The clear supernatent layer was used in these studies. The garlic extract was added to 50 ml. of sterile glucose, tryptone, yeast and tomato extract broth, in a conical flask, so as to give a

Relative susceptibilities of micro-organisms to garlic

Organisms	Conc. of garlic per ml. (mg)	Number of organisms per ml. at the end of			Acidity at the end of 48 hours of incubation (ml. of 0.05 N alkali per 10 ml. of broth)
		0 hrs. × 10^4	6 hrs. × 10^4	24 hrs. × 10^4	
E. coli ...	20	17	22	300	2.1
	15	17	20	290	2.5
	10	17	21	375	3.0
	5	17	3,150	14,500	7.0
	0	17	3,600	16,800	7.8
S. faecalis ...	30	50	55	80	2.5
	20	50	59	100	2.9
	10	50	9,500	18,750	9.0
	5	50	16,000	24,500	10.5
	0	50	27,000	47,000	13.0
L. casei ...	30	20	250	350	3.0
	20	20	500	650	6.8
	10	20	1,550	34,500	16.8
	5	20	2,700	35,000	18.0
	0	20	5,400	41,000	19.0
S. sonnei ...	15	23	25	25	1.8
	10	23	27	30	2.0
	5	23	33	36	2.1
	0	23	1,700	5,000	4.2
M. aureus ...	15	55	92	100	0.8
	10	55	108	110	0.9
	5	55	195	250	1.4
	0	55	4,430	21,600	6.9

concentration of 30, 20, 15, 10, and 5 mg. of garlic per ml. of broth.

The micro-organisms selected for this study were *E. coli*, *S. faecalis*, *L. casei*, *M. aureus*, and *S. sonnei*, 0.4 ml. of the 18 hour old culture of each organism was inoculated into each flask containing sterile broth with and without garlic and incubated at 37°C. At the start and at the end of 6 and 24 hours of incubation, the number of organisms present per ml. of the broth were determined by direct-microscopic count method. The quantity of acids produced by the organisms at the end of 48 hours of incubation was found out by titrating against standard alkali.

It may be observed from the results that the concentrations of garlic required to inhibit *L. casei* and *S. faecalis* are much higher than those required to inhibit *E. coli*, *S. sonnei* and *M. aureus*. While the growth of *E. coli*, *S. sonnei* and *M. aureus* is markedly inhibited at 10 mg. level, the growth of *S. faecalis* and *L. casei* is inhibited only at 20 mg. level. At 5 mg. level only *M. aureus* and *S. sonnei* are inhibited. The results of this investigation are presented in the table.

The results indicate that incorporation of in the diet at moderate levels, is likely to balance of the microflora in the intesti favour of lactic organisms, which generall a favourable effect on the absorption of mi present in the diet.

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METABOLISM OF NITROGEN, CALCIUM AND PHOSPHORUS IN CHILDREN POOR DIETS BASED ON HUSKED, UNDERMILLED AND MILLED RAW RICE

It has been shown by several workers that the degree of milling of raw rice determines the quantity of nutrients lost, particularly vitamins of the B-complex and minerals[1-3]. Undermilling of rice not only increases the thiamine content, but also the phytin phosphorus content[3]. In view of the fact that rice is highly deficient in calcium[2], a higher phytin phosphorus content is likely to affect adversely the utilization of calcium present in the diet.[4] Cullambine and co-workers[5-6] studied the nitrogen, calcium and phosphorus metabolism in adults fed on diets containing undermilled and milled rice. Their results showed that a moderately polished rice with a high calcium content and a moderate phytic acid content gave the best balances for calcium and phosphorus. Similar investigations have not been reported so far on children. The present note gives the results of studies on metabolism of nitrogen, calcium and phosph in children fed on poor vegetarian diets contai husked, undermilled and milled raw rice.

Husked, undermilled and milled raw samples used in this investigation were prep from the same bulk sample of paddy, *Bang* *Sanna*. Undermilled and milled samples of were prepared by milling husked rice to extent of 4 per cent and 7 per cent respective described earlier[3]. The nitrogen, calcium phosphorus contents of the three rice samples determined according to A.O.A.C. methods[7] given in Table I, which reveals that husked was richer in total and phytate phosphorus t undermilled and milled rice.

Seven healthy girls (age 8-11 years and wei 15.6—20.6 kg.) who were residents of a

TABLE I. *Protein, calcium and phosphorus content of husked, undermilled and milled rice*
(values per 100 g)

	Protein (N × 6.25) (g)	Calcium (mg)	Total phosphorus (mg)	Phytin phosphorus (mg)
usked rice	6.76	12.9	338.3	216.0
ndermilled rice (4% millings removed from husked rice)	6.43	10.9	232.8	162.0
illed rice (7% millings removed from husked rice) ...	6.30	9.0	184.9	128.0

rphanage were selected as experimental subjects. hey were fed a poor vegetarian diet which, on a aily average basis, had the following composition.

Rice (husked, undermilled or milled)	320 g
Red gram *dhal* (*Cajanus indicus*) .	15.0 g
Horse gram	5.2 g
Brinjal	20.0 g
Potato	20.0 g
Groundnut oil . . .	20.1 g
Amaranth leaves . . .	10.0 g
Whole milk powder . .	5.0 g
Cane sugar . . .	25.1 g
Tamarind	7.0 g
Common salt . . .	15.0 g
Onions	28.2 g
Condiments . . .	10.0 g

The experimental period, with each sample of ice, was of 15 days' duration; of this first 10 days f experimental period constituted a preliminary ne to allow the subjects to get accustomed to he diet. The collection of urine and faeces was herefore confined to the last five days of the xperimental period. The diet and excreta vere preserved and analysed for calcium, phoshorus and total nitrogen according to the methods escribed by Murthy *et al*[8]. The results obained for the metabolism of nitrogen, calcium nd phosphorus on the different diets are given n Table II.

All the subjects maintained positive nitrogen alance. The apparent digestibility of the proein in the husked, undermilled and milled rice liets was found to be 65 per cent, 66 per cent nd 67 per cent respectively. The low values or the apparent digestibility of protein obtained n our investigations are evidently due to the ery low nitrogen intakes by the subjects. Similar bservations have been reported earlier by McCance and Walsham on diets based on whole wheat[9]. Though the intake of calcium was nearly the same on the three diets, the calcium retention on husked rice diet was very much lower than that on other diets. This was probably due to the high phytate phosphorus content of husked rice which is known to interfere in the absorption of calcium. Out of the seven subjects on husked rice diet, three subjects were in negative calcium balance. The data clearly indicate that consumption of poor vegetarian diet based on husked rice is likely to lead to negative calcium balance. All the subjects on the three different diets were in positive phosphorus balance. The retention of phosphorus on husked and undermilled rice diets was higher than that observed on milled rice diet.

TABLE II. *Mean daily intake, excretion and balance of nitrogen, calcium and phosphorus of children on diets containing husked, undermilled and milled raw rice*

Diet	Intake	Excretion			*Balance	
		Urinary	Faecal	Total		
NITROGEN (mg)						
Raw husked rice ...	4.75	1.70	1.65	3.35	1.40	±0.12† (12 d.f.)
Raw undermilled rice...	4.50	1.73	1.54	3.27	1.23	
Raw milled rice	4.39	1.61	1.46	3.07	1.32	
CALCIUM (mg)						
Raw husked Rice ...	276.5	41.5	224.9	266.4	10.1	±12.8† (12 d.f.)
Raw undermilled rice ...	271.6	48.0	190.6	238.6	33.0	
Raw milled rice	258.5	54.9	164.4	219.3	39.2	
PHOSPHORUS (mg)						
Raw husked rice ...	1020.0	212.7	628.9	841.6	178.4	†±28.4 (12 d.f.)
Raw undermilled rice ...	780.0	164.2	434.3	598.5	181.5	
Raw milled rice	594.7	160.6	315.5	476.1	118.6	

* Differences in the balance of nitrogen, calcium and phosphorus between any two diets are not statistically significant.

† Standard error of the mean.

The authors wish to thank Mr A. N. Sankaran and Miss K. Indiramma for the statistical analysis of the results reported in this paper.

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TECHNICAL AID TO FOOD INDUSTRIES (*published in July 1954*), pp. xvi+270.

This publication, contains the views and suggestions of prominent scientists, leading industrialists and food technologists, and Government officials on the nature of technical aid needed by different food industries in the country. Up-to-date technical and statistical data are provided and an appendix embodying the conclusions of the Symposium as well as a comprehensive index are given.

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(*IS*) 17

Some investigations on santra il, by C. M. Parekh (*June* 21, 1958). —The speaker started with a disussion of the economic importance f the utilization of Sangtra (or antra) peels for the extraction of il, which is an important flavouring material for a variety of food, cosmetic and other preparation. The ountry at present produces hardly 00 lbs. of this oil annually and he balance of a total requirement of about 12,000 lbs. is met by mporting sweet orange oil and mandarin oil from other countries. The author pointed out that Santra peels were available in sufficient quantities in the country as a waste material from the fruit juice ndustry and could be profitably utilized for the production of oil as a valuable by-product, to meet all requirements in respect of orange oil. The oil industry has not, however, developed in the country, and this was ascribed to three factors—Firstly, there is no large scale factory specializing in processing only one kind of fruit, say Santra, so as to be able to set up a plant for the production of the oil; Secondly, the orange juice industry is not even located at one place so as to make possible the undertaking of the extraction of oil as a separate enterprise; and thirdly, there are very meagre data available on the physico-chemical characteristics as also keeping quality of the oil which on the basis of experience has been regarded by the fruit preservation industry to be rather poor. The investigations carried out by the author on Santra oil which mainly aimed at improving the keeping quality of the oil were then described in detail.

Analytical data collected on the physico-chemical characteristics of the oil from Santras grown in different citrus growing regions of the country, i.e., under different soil, climatic conditions and cultural practices, were then discussed and it was pointed out that the samples of oil obtained from various sources not only differed among themselves but also from the Mandarin and Tangerine oils produced in Brazil and Italy. On the basis of this, the author preferred to call this oil as Santra oil and not Mandarin or Tangerine oil although the fruit resembled the Mandarin and was often called as 'Mandarin Orange'.

Discussing the results of experiments carried out to improve the keeping quality of the oil by various, treatments, prior to their storage he said that oils passed through anhydrous Na_2SO_4 followed by neutralization with $NaHCO_3$ and packed under nitrogen in aluminium containers, with the addition of 0.05 per cent NDGA, and stored at 2-5 C had a storage life 12-15 times that of oils kept under normal untreated conditions. Out of the six anti-oxidants tested with respect to their relative performance in relation to the stability of the oil, NDGA was found to be the best. He mentioned that distilled as well as cold pressed oils were available in trade. The flavour of distilled oil is much inferior to that of cold pressed oils and also slightly different from the true flavour of orange peel; nevertheless, the former is more stable during storage. The stability of oils was observed to depend on the Physico-chemical characteristics and composition of the oil. Oxygen absorption measured by a Manometric technique was used for evaluating the stability of oil. The author described how the limits of oxygen could be fixed and used as a measure of the stability of oils extracted from fruits grown and harvested under different conditions. Organoleptic evaluation and peroxide value were both used as indices for correlation. He concluded by saying that these oxygen absorption technique for the measurement of the stability of oil could be used as an index for knowing approximately the age of a sample of oil or for predicting its keeping quality but before establishing this relationship, an extensive work would have to be carried out. The author discussed briefly the future programme of work, on Sangtra oil such as detailed chemical composition of the oil, preparation of stable oil emulsions, study of the fate of oils when added to food products, etc., in relation to the quality of the foods.

Dr Girdhari Lal supplementing, referred to the earlier work carried out at Layalpur on Santra and other citrus oils with reference to their storage behaviour. He also referred to the intensive work carried out under another scheme on methods of extraction of oils.

The discussion that followed covered a number of important points like availability of peels, cost of imported oil, production of terpene-less and sesquiterpeneless oils, reclamation of deteriorated oils, synthetic orange oil, the oxygen absorption technique and its relationship with peroxide value. The importance of stability test by oxygen absorption for the evaluation and standardization of oils etc.

The President in his concluding remarks mentioned that besides the importance of trade samples and their evaluation, quality investigation on chemical composition of the oil is also important. He also pointed out the need for studying the production, quality and storage behaviour of oil from dried peels.

S (IS) 18

Preservation of vegetables and fruits by dehydration, by E. G. B. Gooding * (*July* 2, 1958).—The speaker illustrating his talk by a filmstrip explained that his remarks would be primarily about the present day Industry and research work in U.K.

Ever increasing quantities of horticultural produce are going to the food processing industry, and more and more people eat vegetables and fruits in preserved form. Canning and bottling are well known and fully accepted methods of preservation, and quick-freezing is developing rapidly. Dehydration is a method which is less well known and which is associated in the minds of many ex-soldiers with unsatisfactory meals under unpleasant conditions, but new techniques are yielding greatly improved products.

The essential feature of dehydration is that nearly all the water is removed from the prepared foodstuff by scientifically controlled processes in such a way that when the water is replaced and the foodstuff cooked, it closely resembles the freshly cooked material in all respects. A special feature of dehydration, and one which makes it particularly valuable for military purposes, is the small weight and bulk of the products. A fresh cabbage, for example, usually contains 90-95 per cent of water, and one-third to one-half of the original cabbage is coarse outer leaves or core. The outer leaves and core are removed at the dehydration factory, and nearly all the water, with the result that the dehydrated cabbage weighs only about one-twentieth of the original cabbage, while there is a corresponding decrease in bulk. A method of compression now under development enables even greater reduction in bulk of certain vegetables: for example, compressed cabbage or carrot blocks, measuring approximately 6 in. diameter and ½ in. thick, weighing 8 oz., each contain enough vegetable to provide 3-ounce servings for about 15 persons.

To the caterer and the housewife, where reduction in weight and bulk is perhaps less important than to the Services, attractive features of dehydrated vegetables are that no preparation is needed in the kitchen and there is no waste. Further, the contents of the package do not necessarily have to be consumed immediately after opening and no refrigerated storage is required.

In the dehydration factories, raw vegetables of the highest quality are selected, washed, peeled, trimmed or cored, cut into pieces of a suitable size for drying (usually dice, strips or shreds, occasionally slices), given a short pre-cooking and sterilising heat-treatment, and dried in heated air under carefully controlled conditions of temperature and humidity. Packing of these products is normally in sealed cans in an atmosphere of nitrogen, since they are not only hygroscopic but also liable to deterioration as a result of oxidation.

In the United Kingdom, dehydrated vegetables have been handled in commercial factories for several years, and there is an increasing civilian market for such products, while at Aberdeen in Scotland, the Experimental Factory of the Ministry of Agriculture, Fisheries and Food carries out research on the development not only of dehydrated vegetables and fruits, but on fish and meat as well.

Research at Aberdeen has been conducted on two main lines: f short term studies on impr existing processing, and on products which can be obtaine hot air drying techniques; secon the long term studies on develo alternative methods of dehydr to produce a greater variet products of the highest qu Such investigations will aid in pansion of the dehydration Indu Unfortunately, with so much phasis on practical problems, basic chemistry and histolog these foods have not received th tention required, though some w has been done on the pigments chemistry of certain fruits.

There have been consider advances in knowledge about effects of processing variables particular scalding) and ab techniques of hot-air drying, w the tropical storage life of sev products has been doubled trebled. Vacuum contact-p dehydration, and its latest exp mental development, accelera freeze drying, have yielded produ which are in some cases, compara in quality with the frozen materi

Experimental rations have be made containing a variety of p cooked dehydrated foods, which c be prepared for eating in 5 minu and fruit bars based on dehydrat apples, citrus and sugar, are bei tried as sledging rations in t antarctic.

The talk was then followed by interesting discussion and t speaker answered various questio that were raised. The Preside in his concluding remarks applau ed the work carried out at Aberde and said that although work at th Institute has been started, mu more has to be done to make deh drated products suitable for a acceptable to large sections of th people in India.

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* An FAO Expert from the low temperature Research Station, Aberdeen, United Kingdom.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Canning of prawns

(IS) 62

Could you kindly furnish the etails of the procedure to be followed or producing canned wet pack of rawns? (Mangalore).

The following are the various teps to be followed for the canning f prawns:

Treatment of prawns when caught: When the prawn net is emptied and he prawns are culled from seaweed tc., they should be thoroughly washed in sea water to remove all irt, slime etc.

Icing: The prawns should then be iced sufficiently to avoid heating and subsequent black staining of the prawns. Holding of the prawns for at least 5 to 10 hours also assists n the easy removal of the shells.

Peeling: Peeling consists of emoving the hull, legs and head nd is carried out by hand.

Washing: The meats are washed by fresh water in a flume which carried them from the picking table o the canning room.

Blanching: The drained meats for wet pack are placed in a metal basket of 25 lb. capacity, blanched for usually 8-10 minutes in boiling brine containing about 1 pound of salt per gallon water. A complete change of brine is made after about every seventh cook. The meats curl during blanching operation and take on their characteristic pink colour. If the brine is not kept boiling vigorously, the meats will link together and curling will not occur.

Filling and sealing: The blanched meats are filled into the cans* and 2% hot brine is added to the desirable extent. The cans are sealed immediately following the addition of the hot brine.

Processing: The cans should be processed as soon as possible after closure according to the following conditions:

Can size	*Processing time in minutes*	
	240°F	*250°F*
211 × 400	25	13
307 × 208	25	13

Cooling: After processing, the cans should be promptly water-cooled.

Canning equipment: The following equipment is required in this connection. Can reformer, Hand flanger, Seaming machine, Semi-automatic vacuum sealing machine, retort and miscellaneous items like stainless steel baskets, etc. The Metal Box Co., may be approached for the supply of the above items of equipment.

Preparation of unfermented apple juice

E (IS) 63

Let me know the method of preparation and preservation of unfermented apple juice?

For preparing unfermented apple juice, select fully developed (flavour and aroma) fruits even though of low grade variety or cull fruits of superior variety. Wash the fruit in a weak (1:20) hydrochloric acid solution to remove the arsenical and lead spray residues if any, and then wash thoroughly in running cold water, preferably in small lots at a time to remove the acid and other foreign matter. Grate the fruit in a stainless steel or tinned grater as this process facilitates the extraction of the juice without tarnishing it. Wrap the grated fruit in a thick cloth and press out the juice in a small basket type-hand worked press and collect the juice in an enamelled or stainless steel bucket.

Strain the freshly prepared juice through a thin layer of cotton wool or a coarse muslin cloth and heat rapidly to a temperature of 185° F. (hot enough to touch) on direct fire in an aluminium pan. Pour the hot juice at once into clean and hot sterilized bottles (heated in boiling water for 10-15 minutes) till it over-flows. Immediately seal air-tight with crown cork (also previously boiled in water for 2-3 minutes).

Note: It is absolutely essential that the temperature of the juice while filling and sealing as given above should not go below 180°F in any case.

Place the bottles horizontally on the false bottom (double or four fold thick cloth being placed at the bottom) of a pan containing water at 175° F which temperature must be maintained for half an hour. Remove the bottles and after they are cooled, store in a cool dry place.

Preparation of cashew apple candy

E (IS) 64

We have abundant quantities of cashew apple available in these parts during the season and generally it goes waste due to its astringency. We shall be much obliged if you can inform us as to how this astringency can be removed and then used for the preparation of a candy?

Cashew apple is fairly a rich source of vitamin C and contains some sugars. The procedure for the removal of astringency and the method of preparing candy are given below:

---

* S. R. lacquered cans or cans lined with "C"-enamel, seafood formula, are suggested for prawn meat. Cans for "dry-pack" shrimp should be lined with a one- or three-piece vegetable parchment paper-liner.

Select fresh, fully ripe and sound (free from blemish) fruit of any colour. Wash the fruit thoroughly in running cold water rubbing with hands (covered with rubber gloves), if necessary. Immerse the washed fruit in 2.0 per cent common salt solution and raise the concentration of salt by 2.0 per cent every day so that in 5 days' time it gets to 10 per cent. When the salt concentration reaches 10 per cent, add also potassium metabisulphite at 1 oz. per 100 lb. and keep the fruit in this solution for a further period of 2-3 days. After this, wash the fruit thoroughly in water, put in a perforated crate made of aluminium or monel metal and blanch in boiling water for 5 minutes followed by steaming in a pressure cooker for 5 minutes at 5 lb. pressure. Cool the steamed fruit by rinsing in water and give thorough pricks all round, to each individual fruit, with sharp bamboo needles.

Prepare sugar syrup of 30° Brix by dissolving $4\frac{1}{2}$ lb. sugar in every gallon of water, add 0.1 per cent citric acid and boil for about 10 minutes. Pour the hot syrup over the fruit placed in an enamelled, aluminium, monel metal or stainless steel vessel, adding enough syrup to completely submerge the fruit. Keep the fruit immersed in the syrup by putting over it a flat cover and a weight. Cover the container with its lid and keep it aside for 24 hours or so. Next day, drain out the syrup from the fruit, find its Brix and weigh out the sugar to be added to it to raise the Brix to 35°. Boil the drained syrup for 5-7 minutes, add the sugar, bring to a boil again and pour it back over the fruit. Repeat the heating and steeping process as above, adding enough sugar every day to raise the concentration of the drained syrup by 5° Brix till it reaches 60°; after this, repeat the process on every alternate day till the final syrup strength is 70° Brix. Leave the fruit in the final syrup, for complete absorption of sugar, for a further period of 5-6 days, determining the Brix of the syrup every day and heating it to boiling, if necessary. Strain the fruit on a coarse sieve and finally dry the finished product to make a candy. Pack the dried cashew apple candy in dry screw glass jars and close air-tight. Store the filled jars in a cool, dry place.

Note: In handling this product, iron equipment should not be used as this will blacken the product.

Curing of fresh paddy

E(IS) 65

I shall be highly grateful to you if you can instruct me the method that has been recently developed by you to cure fresh paddy in order to obtain a rice which will resemble old raw rice in cooking characteristics. I would like to adopt the method on a commercial scale in our mills. (Shimoga).

While rice from stored paddy possesses desirable cooking properties, rice from freshly harvested paddy cooks to a pasty mass, and yields a thick viscous gruel during cooking. It does not also swell to the maximum extent like old rice. Researches have been undertaken at this Institute to study the possibility of giving some type of simple treatment to the freshly harvested paddy in the rice mill so that it yields after milling a rice that possesses the desired cooking qualities of old stored rice. The following method of treatment of freshly harvested paddy gives a rice which looks and cooks like old raw rice and possesses, besides, the nutritional properties of parboiled or homepounded rice. The cured rice also possesses the higher swelling property characteristics of old rice.

Treatment of paddy: The treatment, which is a very simple one and therefore can be adopted by all rice parboiling mills, consists in steaming the fresh paddy in the steaming kettle until steam emerges
from the bottom and the top
kettle and then keeping it
hot condition for about one
The paddy is then dried by a
either in the shade or in mild
ing or morning sun with occ
turning over of the paddy. I
in the hot sun is to be avoi
cracking will occur and broke
will result. As the paddy
soaked in water prior to the ste
the drying of the paddy is
(about one hour) and the
rice appears like raw rice its

Cost of treatment: The c
steaming and drying involved
treatment is a nominal one
than a rupee for 100 seers of
and the consumers would
bear this small extra cost in c
deration of the improved co
qualities conferred by the treat
The cost of treatment shou
considered to be very small i
as the difference in cost bet
old and new rice in com
varies between 10-15 rupees
palla, depending upon the a
bility of old rice.

Varieties suitable for treat
The steaming treatment desc
above is essentially one of
gentle parboiling. For this re
the grain treated by this meth
not as hard as fully parboiled
and there is, therefore, g
breakage during milling th
normal for fully parboiled
The hard varieties of rice whic
conventionally used for obtai
raw rice can, however, be subj
to this steaming treatment to o
a product resembling old raw
If the steaming treatment is
prolonged, then an opaque
that cooks hard like parboiled
can also be obtained. The c
varieties of rice that are comp
ively soft undergo high brea
when subjected to the stea
treatment in its present form. S
other modified form of treatm
seems to be necessary to
sufficient hardness to these varie

Nutritive value of the tre
fresh rice: Besides possessing
appearance and cooking characte
ties of old raw rice, the trea

esh rice also has the nutritional alue of homepounded or parboiled ce. It has more thiamine, for nstance, than the untreated raw ice. The steaming treatment is herefore an ideal method of supplying a nutritious form of raw rice. Even old paddy can be subjected to he steaming treatment to improve he nutritive value of the rice. As he paddy is not soaked in water, he treated rice retains its opaqueness unlike fully parboiled rice which is translucent and has an ellow tinge.

Consumer acceptability: Consuner trials in Mysore have shown that the treated rice is accepted eadily by the habitual cosumers of both raw and parboiled rice. The vailability on the market of the ured fresh rice will be a great benefit, especially for the poor and middle class people, who cannot fford to pay the very high price or old rice.

Smoke-curing of garlic bulbs

E (*IS*) 66

What are the advantages in the smoke-curing of foodstuffs? How is it carried out in the case of garlic bulbs and what would be the storage life of the cured bulbs? (Jamnagar).

Smoke-curing of foods improve their keeping qualities and impart desirable organoleptic properties as a result of partial dehydration of the material, incorporation of antioxidants and antiseptic constituents present in the smoke into the food and destruction of micro-organisms that might be present by heat. For the production of smoke, shavings and sawdust of hard woods particularly oak are preferred to those of soft woods such as fir. The preserving properties of smoke have been attributed to aldehydes, phenols and aliphatic acids. Formaldehyde present in the smoke is one of the chief bactericidal constituents.

Garlic bulbs are smoke-cured in a curing chamber connected to a kiln, where smoke is produced by burning teakwood sawdust. By manipulating the valves of the mkiln, a stream of smoke of unifor velocity is allowed to enter the smoking chamber and condensates are not allowed to form in the chamber as this would otherwise affect the organoleptic qualities of the smoked product. The garlic bulbs are put in trays which are placed in the chamber. The temperature within the smoking chamber is about 90-95°F. After smoke-curing the bulbs, they are stored at room temperature. It has been found that the cumulative percentage physiological losses in weight in garlic bulbs during storage are found to be lower, the longer the duration of smoke-curing. Smoke-curing also inhibits the sprouting of garlic bulbs to some extent. On 10% wastage basis, the storage life of garlic bulbs smoke-cured for 7 hours was 38 weeks as compared to 10 weeks in the case of untreated bulbs.

Nutritive value of Indian preserves

E (*IS*) 67

Will you please inform me about the nutritive value of some of the common Indian preserves? (Amritsar).

Some of the preserves commonly prepared are from apple, amla, ash gourd, carrot and coorg oranges. All the preserves are rich in sugars which are present to the extent of nearly 51-66 per cent in the fruit and syrup of the preserves. In the case of amla preserve, practically the whole of the sugar is present as invert sugars, while the degree of inversion varies from 43-70 per cent in other preserves. The preserves are also rich in calcium, but poor in ether extract, protein, phosphorus and iron. The calcium content of the solid portion is comparatively more than that of the syrup portion of the preserves. The preserves in general are not very good sources of vitamins except in the case of carrot preserve, which is a fairly rich source of carotene which is more stable towards heat than other vitamins. Most of the ascorbic acid is lost during the process of manufacture. Thus, *amla* preserve has only 12.2 and 38.0 mg. per cent ascorbic acid in fruit and syrup respectively as against an initial value of 600 mg. per cent in the fresh fruit. Some of the trade samples of *amla* preserve are found to be totally devoid of ascorbic acid. Coorg orange preserve has likewise no ascorbic acid. The preserves are found to be poor in their thiamine content.

BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products. **Price:** Re 1.00 (*postage extra*)

Notes and News

STATISTICAL NOTES

All-India Final Estimate of Jowar, 1957–58

	1957–58 (Final Estimate)	1956–57 (Partially Revised Estimate)
Area (thousand acres)... ...	41,411	40,367
Production (thousand tons) ...	8,056	7,249

(*Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India*).

NEWS BRIEFS

Sorbic acid controls yeast in cucumber fermentations: In cucumber brines, both surface and subsurface yeast growths are effectively inhibited by sorbic acid concentrations of 0.01—0.10 per cent.

Occasional yeast activity has been found at 0.01 or 0.02 per cent, and insignificant amounts at higher concentrations.

Lactic acid development is not affected below 0.03 per cent sorbic acid. At 0.1 per cent lactic acid fermentation is inhibited by initial brine strengths of 20-40 deg. salometer, and at 0.05 per cent an initial brine of 40 deg. salometer inhibits the fermentation. Higher concentrations of sorbic acid may therefore be used when the salt levels are low.

When salted at 20-35 deg. salometer, 2.5 lb. of sorbic acid per 100 bushels of cucumbers (about 0.025 per cent) should inhibit yeast growth without impairment of lactic acid development (*Food Engg.*, March 1958, p. 129).

Effect of temperature rise on bulk milk quality: Addition of warm morning milk to the previously cooled evening product in farm tanks produces no detectable rancidity on cooling, provided temperature of blend does not greatly exceed 60°F.

And further additions associated with every-other-day pickup actually dilute the rancidity level and delay overall increase.

These are findings of investigations at Cornell University in which aliquots of morning milk (cooled to give desired blend temperatures of 40, 50, 60, and 70°F) were added to evening milk at 40°F. Lipase activity was determined after 0, 24 and 48 hours, and flavour tests were made after 72 hours.

There was little rise in lipase (as acid deg. values) with blend temperatures as high as 60°F. But at 70°F, a rise of 0.2 acid deg. occurred which was sufficient to be detected organoleptically (*Food Engg.*, March 1958, p. 130).

Low-toxicity insecticides: New insecticides that are only $\frac{1}{8}$th as toxic to warm-blooded animals as pyrethrum and 1/3rd as toxic as allethrin have been discovered by USDA chemists at Beltsville, Md.

They are derivatives of chrysanthemumic acid, a synthetic material similar to an acid found in flower of the chrysanthemum family. The 2 best esters were made with 6 bromo-piperonyl alcohol and 6 chloro-piperonyl alcohol.

In preliminary tests on insects, these compounds were shown to be equal or better than either pyrethrem or allethrin at high levels of kill, although somewhat slower in 'knockdown'.

Both compounds were less effective than DDT and other hydrocarbons. However, the new material gave good results against larvae of the common malaria mosquito, codling moth, salt marsh caterpillar and southern army worm.

The esters, while considerably more expensive than DDT and other chlorinated hydrocarbons, cost less to make than allethrin (*Food Engg.*, March 1958, p. 132).

2-Stage sterilization helps evaporated milk stability: Employment of a 2-stage method in sterilisation of ed milk improves storage when final temperature of are used. But when a temper of 260°F. is used, no part benefit is achieved.

In a study of effects of 2-stage-sterilization procedure the physico-chemical properti evaporated milk, an interme holding period was introc during heating and cooling

Samples were held at 220° 10 min., and at 200° for 10 min., then heated, respectivel 240°F. for 15 min., 250° for 7 and 260° for 1 min., before coo For the come-down tests, san were heated to sterilizing, held, cooled to 220 or 200°F. and for the above times before the cooling.

Inclusion of a come-up hol period produced a significa greater viscosity than the cor ponding single-stage processe 240-50°F. Difference was significant in samples sterilize 260°F.

With the come-down hol period there were no signific increases in viscosity nor reduct in separation of immiscible mate Also, this method resulted i darker coloured milk than corresponding come-up hol method (*Food Engg.*, March 19 p. 134).

New transparent wrap fresh meats: A new transpa film designed for wrapping fr meats, has been developed by Olin Mathieson Chemical Corp tion, New York. The film, w is said to be less expensive th current standard meat films, claimed to retain the appear of fresh meat better and m uniformly, to provide supe protection, and to handle m easily than standard types.

Tests have shown that the transparent film, called Olin C 16, absorbs moisture four tin faster than conventional film thus permitting oxygen to reach the meat more quickly (*Food*, March 1958, p. 101).

Edible toasted soy proteins: General Mills' Soybean Division, Minneapolis, Minnesota, has introduced a new line called 'Toasted Soy Proteins'.

The new products contain 50 per cent by weight of pure protein and are designed to improve the nutritive and flavour qualities of a wide variety of food products, including breakfast foods, meats, breads, canned soups, crackers, macaroni, pancake, waffle and doughnut mixes.

The new soya line is being made in four granulations, ranging in fineness from flour to coarse grits. Cost of the new soya products will be considerably lower than most protein sources. They are claimed to be an economical source of amino acids, are low in fat and fibre content and have good stability properties (*Food*, March 1958, p. 110).

Improved mould and rope inhibitor for baking industry: An improved mould and rope inhibitor, 'Mycoban' sodium or calcium propionate, has been developed for the baking industry by the Polychemicals Department of E.I. du Pont de Nemours and Company Inc., of Wilmington, Delaware. The improved inhibitor, free of foreign odour and non-caking, contains no filler, and does not change the flavour, texture or appearance of bread or other bakery products, it is claimed. 'Mycoban' inhibitor, according to the company can extend by 3 days the average number of days added by propionates to the normal mould-free life of white and dark breads at 85° F and 80 per cent humidity (*Food*, March 1958, p. 110).

Chlorella: Research on the production of chlorella has been carried out in Japan during recent years. The present efficiency of production, in an experimental plant in Tokyo, is about 12.4 grams of dried material in an area of 1 square meter. Existing production is small but the practicability of increasing it is being considered and attention is being given to lowering the cost of production. Chlorella, which tastes like green tea, might be mixed in bread, soups, cakes, ice cream, *miso* and other foods. Its composition, which is shown below, would make it a valuable 'enriching' agent.

	Per 100 grams
Protein	40-50 grams
Fat	10-30 ,,
Carbohydrate	10-25 ,,
Vitamin A	10,000 — 30,000 IU.
,, B_1	0.04 — 0.24 mg.
,, B_2	0.21 — 0.58 ,,
,, C	20.50 ,,

(*FAO Nutrition Meetings Report Series* No. 14, p. 32).

Food from fungi: Many of the traditional agricultural practices of the world, and many of the most favoured foods, represent in fact a very wasteful use of our resources, and to meet the challenge of a growing world population we may all eventually have to accustom ourselves to new types of food. Amongst these, fungi have been said to offer some of the most promising possibilities. In a recent review of the uses of fungi for edible purposes, it has been pointed out that they offer many advantages not found in other forms of life. They can be produced, for instance, in a much shorter time than the higher forms of green plants, and although their lack of chlorophyll prevents them from synthesising food from basic materials as simple as carbon dioxide and water, many of them are able to produce edible materials from otherwise inedible waste. Since they do not require light for energy, they can work on this conversion for 24 hours per day and they can often be adapted to the efficiency of submerged culture. Their efficiency in the production of protein from a given quantity of carbohydrate is about 65 per cent, as compared with about 20 per cent for pork, 15 per cent for milk, 5 per cent for poultry, and 4 per cent for beef, and it is estimated that the produce of an acre of land can be transformed into ten times as much fungal protein as meat protein. Moreover, the proteins themselves are in many instances surprisingly similar in analysis to proteins of animal origin, so that this extra efficiency is not obtained at the cost of a marked lowering in nutritive value.

Fungi can also be utilised for the production of fats, and it has been estimated that one acre used for the submerged culture of fungi or algae could produce fat equivalent to that yielded by 25 acres of a vegetable oil crop.

One of the greatest advantages offered by fungi as a food or fodder crop, however, is the fact that they can be grown not only on such cheap carbohydrate sources as molasses and potato and other vegetable wastes, but also on such materials as cannery and dairy waste products, lumber and pulp mill waste, straw, grain hulls, brewery waste and even the waste liquor from some processes connected with the clothing industry. Many of these materials are completely inedible, and their disposal may indeed present a problem. Their use for the cultivation of fungi therefore represents a double economy, as problems of effluent disposal may be solved at the same time as highly nutritious foodstuffs are produced (*Food Manuf.*, April 1958, p. 131).

Fluorine in foods: A report has now been issued containing the revised recommendations of the Food Standard Committee on the fluorine content of foods. It draws attention to the considerable amount of evidence which exists that drinking water containing about 1 p.p.m. of fluorine has a beneficial effect in reducing the incidence of dental caries, and lists some of the adverse effects resulting from the ingestion of excessive amounts of fluorine.

Referring to foods in which the content of fluorine is likely to be high, the report states that shellfish may contain from 5 to 15 p.p.m. whilst dry tea may contain as much as 100 p.p.m. No toxic effects are considered likely from ingestion of fluorine from these foods, however.

The only commodities for which revision of the existing regulations is recommended are acid phosphates and products such as baking powder and self-raising flour in which they may be incorporated.

At one time such acid phosphates were produced mainly from rock phosphate, and contamination with fluorine was extremely difficult to overcome. The Fluorine in Food Order, 1947, therefore laid down limits of 300 p.p.m. fluorine in the phosphates themselves, 100 p.p.m. in baking powders, and 8 p.p.m., in self-raising flours. The Food Standards Committee has now been informed that the use of rock phosphates in the preparation of acid phosphates is no longer necessary, and has concluded that the existing limits, whilst constituting no direct hazard to public health are higher than are required by good commercial practice, and ought in consequence to be reduced.

It therefore recommends that maximum permitted amounts should be reduced to 30 p.p.m. in acidic phosphates and in articles of food containing them, other than baking powder, for which the limit should be 15 p.p.m., and self-raising flour and similar mixtures, for which the limit should be 3 p.p.m. (*Food Manuf.*, April 1958, p. 142).

NEW INDIAN STANDARDS

Activated carbon: According to information available the Indian Standards Methods of Sampling and Test for activated carbon used for decolourizing vegetable oils and sugar solutions (IS:877-1956) is the first attempt in the world to lay down a national standard on the subject. The standard prescribes the methods of sampling and tests for determining moisture, ash, bulk density, matter soluble in water and dilute hydrochloric acid, titrable acidity or alkalinity and pH value of the aqueous extract. Screen analysis and methods of determination of filtrability, oil retention and decolourizing power have also been prescribed.

It is hoped that the methods prescribed in this standard will enable the producers as well as consumers to assess the quality of the material and will also serve as an incentive to the indigenous industry. In preparing this standard, due consideration has been given to the various methods suggested by different authorities on the subject and the technical information available in the country in this field (*ISI Bull.*, March 1958, p. 99).

Sago (Saboodana): Sago is a processed food starch marketed in the form of small globules or pearls. In Hindi it is popularly known as 'Saboodana'. It is an easily digestible food specially recommended for convalescing patients. In certain parts of the country, such as South India, it is used in the preparation of many table delicacies.

The name sago is derived from the fact that the original product used to be manufactured from the starchy core of the stem of sago palms. With the passage of time, it was found that sago could also be manufactured from other starch bearing materials, such as tapioca roots, potatoes, etc.

India has been manufacturing sago from the starch obtained from the roots of tapioca for nearly 15 years. When the country was wholly dependent upon imports for its requirements of sago, even the imported material was of the same type and made from the same material, i.e., roots of tapioca as is now manufactured in the country. The indigenous production in India is sufficient for the country's need and to a certain extent surplus. The sago industry is a protected industry.

With a view to providing an agreed connotation for sago as marketed in the country and thereby avoiding the difficulties confronted by the industry, trade and Mysore State Government, the formulation of Indian Standard Specification for Sago (Saboodana) (IS: 899-1956) was taken up at instance of the Central F Technological Research Instit Mysore and the Ministry of C merce and Industry.

The standard, in addition to t various requirements, such as of globules, extent of gelatinizati colour, etc., and chemical require ment, also details methods of sa ing and tests for these requiremen (*ISI Bull.*, May, 1957, p. 139).

PATENTS

Indian

(A few of the Patents Appli tions notified as accepted Part III, Section 2 of the Gazette of India from 1st February to 8th February are listed below).

58,240. *Process and apparatus mixing or homogenising powd material:* Introducing compressed air at different pressures through separate annular zones at the bottom of the column of material to be homogenised.—Patented by K. G. Klinger.

61,459. *Continuously operatin centrifuge:* Plurality of sleeve walls arranged in polygonal formation, said sleeve walls being adjustable in their inclination relative to centrifuge axis.—Patented by G. Nebel.

61,552. *An improved fruit or vegetable peeling or cleaning machi:* A receptacle provided with a hinged or removable cover, a horizontally disposed disc rotatably supporte within receptacle form vegetable chamber. — Patented by The Prestige Group Limited.

61,596. *Apparatus for continuously treating cereal grains:* An inclined cylinder rotatable about its longitudinal axis and means for feeding grains and enriching solution in a predetermined proportion. —Patented by Takeda Pharmace-tical Industries, Limited.

57,955. *Process of obtaining n bitter stabilized soya bean flour hav perfectly assimilable protei apparatus therefor, and the fl obtained by this process:* Dry heat-g soya material, spraying it with ter.—Patented by G. Duchonge.

58,001. *Composition for treating abetes:* Comprising n-butyl sulnidyl urea and a pharmaceutical rrier.—Patented by C. F. Bochnger and Soehne G.m.b.H.

58,103. *Process for the preparaon of diaminopimelic acid:* Growg a mutant of *E. Coli*, which reuires lysine for its growth and cks the enzyme diaminopimelic cid decarboxylase under submergd aerobic conditions.—Patented y Chas. Pfizer and Co. Inc.

58,121. *Closing device for bottles, ontainers and the like:* Closure btained by surface contact between pening of bottle and the lining of ork, rubber or like resilient material rovided on non-resilient cylinirical projection provided internally n the screw cap.—Patented by lembic Chemicals works Co., Ltd.

58,397. *Improvements in modified olyvinyl halide resin compositions:* Comprising polyvinyl halide and olyvinyl pyrrolidone and using aid mixture for sizing glass surface. —Patented by General Aniline and Film Corporation.

59,204. *Process for preparing ibberellic acid:* Introducing carbonlioxide in aerated nutrient solution or cultivation of strain *Gibberella ujikuroi*.—Patented by Imperial Chemical Industries Limited.

61,782. *Process for the preparaion of lysine:* Contacting diaminoimelic acid with enzymes produced by a microorganism of the group *A. aerogens* and a strain of *E. coli* which does require lysine for ts growth.—Patented by Chas. Pfizer and Co., Inc.

Foreign

2,817,590. *Yeast improves heese:* Flavour of grated American cheese can be enhanced and substantially stabilized by the addition of a relatively small quantity of yeast.

For best results both cheese and yeast should be of a particle size less than 40 mesh. And inasmuch as the yeast is not used for its leavening properties, it should be in a relatively inactive form.

For example: Approximately 97 lb. of grated American cheese was mechanically mixed with about 3 lb. of dried brewer's yeast. It was found that the mixture had enhanced cheese flavour compared with that of cheese alone, and that this flavour lasted longer than of cheese alone under the same storage conditions (*Food Engg.*, March 1958, p. 125).

2,816,039. *Powdered fruit juices* (U.S.A.): Produced by thinfilm vacuum evaporation of 70-85 per cent concentrate to 96 per cent solids, cooling, grinding (*Food Engg.*, March 1958, p. 189).

2,817,588. *Decaffeinated coffee:* Prepared by immersing in aqueous coffee-solubles solution, solvent extracting, separating of product, water-washing.—Patented by Standard Brands, Inc., New York City (*Food Engg.*, March 1958, p. 189).

2,815,287. *Extracting colour from annatto:* By soaking seeds, contacting with fatty oil.—Patented by M. B. Barnett, Long Beach, California (*Food Engg.*, March 1958, p. 189).

2,815,783. *Decorticating sesame seeds:* By treating with hot caustic, removing hulls.—Patented by Palazio, Horvileur and Co., Monagua, Nicaragua (*Food Engg.*, March 1958, p. 189).

787,515. *Containers:* Relates to apparatus for testing containers such as cardboard or corrugated board packages by subjecting them to continuous vibrations in order to determine their resistance to the loading likely to be imposed on them in normal use and transportation.—Patented by Abert E. Reed and Co., Ltd. (*Food Trade Rev.* February 1958, p. 42.)

787,225. *Flour:* To improve the baking quality of flour or dough, a small quantity of ascorbic acid and/or reductic acid, together with a small quantity of a glucose-oixidase-containing preparation, is added thereto.—Patented by Koninklijke Industrieele Maatschappij Voorheen Noury and Van Der Lande N. V. (*Food Trade Rev.*, February 1958, p. 62).

787,788. *Sausages:* To prevent the discolouration of sausages due to the presence of water entrapped within the casing, hot air is directed on to the sausage for a time sufficient only to dry the casing and the layer of meat adjacent thereto, whereby the sausage changes a deeper shade of red or brown and the red corpuscles in the meat to become a deeper red to give the sausage a fresher appearance.—Patented by P. H. Hilgeland (*Food Trade Rev.*, February 1958, p. 42).

789,091. *Cake mixes:* Relates *inter alia* to a single package cake mix adapted for use in the preparation of an angel food cake, comprising dried egg white, sucrose and a farinaceous ingredient, the mix containing an anti-foaming agent (e.g., hexane extractible fat) in an amount sufficient to prevent excessive swelling of the foam batter on baking, and subsequent collapse of the cake on cooling.—Patented by O. J. Brunn (*Food Trade Rev.*, March 1958, p. 44.)

789,615. *Fish:* A method of preserving small fish and shellfish, such as brisling, sardines, prawns and shrimps, in fresh condition during the interval between their catch and handling by canning or bottling factories, comprises deep freezing the fish in a thickened salt solution, the salt content of the solution being such that the thawing temperature of the frozen solution is lower than the thawing temperature of frozen fish and preferably below—2°C., and the thickener being present in such a quantity that the viscosity of the solution at room temperature does not exceed 3,000 cpc.—Patented by A/S Proton and another (*Food Trade Rev.*, March 1958 p. 44).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

GERMAN

BIOCHEMISCHE ZEITSCHRIFT

1957, Vol. 329, No. 5

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART II (Indian)

ANALYTICAL

Agar electrophoresis; Part IV. Circular agar electrophoresis, by Giri, K. V., *J. Indian Inst. Sci.*, 1958, **40** (2), 37.—A technique of circular agar electrophoresis is described which possesses the advantages of analysing large number of serum samples simultaneously on the same plate; resolution of the protein components into compact zones and evaluation of the components by colorimetric determination of the stained zones after elution with alkali oils and fats.

2-Acetyl-pyridoxim as a colorimetric reagent for copper and iron, by Tripathi, K. K., and Banerjea, D., *Sci. & Cult.*, 1958, **23** (11), 611.—2-Acetyl pyridoxim forms a deep yellowish green coloured complex with copper salts in alkaline medium and this can be used for the colorimetric estimation of the metal using a spectrophotometer. The maximum absorption is found to be at 410 mμ. at a pH of 10.0-11.7. The colour developed is stable between 15° - 40° C and addition of excess reagent does not affect the colour. Beer's law is also obeyed over the range of 0.5-40 p.p.m. of copper. The colour is due to the formation of a complex by the reagent with cuprous ion formed as a result of the reduction of cupric ion. Iron can also be colorimetrically estimated by following a similar procedure. A red colour obtained with ferrous iron in alkaline medium and the absorption peak is at 525 mμ Various ions which interfere in the above two estimations have been given.

K.L.R.

Quantitative isolation of DL-glutamic acid from a mixture of DL 2-pyrrolidone-5-carboxylic acid and DL-glutamyl-glutamic acid, by Goto, S., *et al.*, *J. Indian chem. Soc.*, 1958, 35 (1), 80.—Glutamic acid is present in a straight chain peptide. A quantitative yield of 541 mg. of DL-glutamic acid hydrochloride has been obtained when a mixture of 129 mg. of DL-2-pyrrolidone-5-carboxylic acid and 276 mg. of DL-glutamylglutamic acid is refluxed with 25 c.c. of 6 N HCL on a waterbath for 16 hours. The melting point and Rf value of the product were identical with that of genuine glutamic acid hydrochloride. This indicates that glutamic acid is present in the natural protein as a linear peptide as well as a peptide of 2-pyrrolidone -5-carboxylic acid.

K.L.R.

BIOCHEMISTRY AND NUTRITION

Further observations on cooking water and thiamin stability, by Roy, J. K., *J. Indian chem. Soc., Ind. & News Ed.*, 1957, **20** (1), 42.—It has been shown in this study that the pH of the water used for cooking rice and pulses has a great bearing on the extent of stability of thiamine. On boiling many natural waters, the pH shifts to the alkaline side as a result of the expulsion of CO_2 from alkali bicarbonates which are present in the water. This alkaline pH brings about a quick decomposition of thiamine. The total alkalinity of water and acidity of foodstuff greatly influence the pH change. When rice and one type of pulse, lentil were cooked in varying amounts of natural (tube-well) water, the thiamine was destroyed to varying extents. In the case of cooked rice, when the final pH was 9.1, nearly 75 per cent of the thiamine was destroyed while only 10 per cent loss was observed when double distilled water was used and the final pH was 6.8. The losses in the case of cooking lentil under identical conditions were 50 per cent at pH, 8.6 and 9 per cent at pH, 6.7. The lower loss observed in the case of the lentil is due to the fact that the pulse weight for weight contains more acid than rice, and hence its power of overcoming the alkalinity of natural water is higher.

K.L.R.

Studies in experimental diabetes. Part VI. Effect of desiccated thyroid and corticotrophin and their combination with insulin on alloxan diabetes in albino rats, by Mukherjee, S. K. De., U. N. and Mukerji, B. *Indian J. med Res.*, 1958, **46** (3), 403.—Effect of pre-treatment with insulin, corticotrophin and desiccated thyroid separately on the diabetogenic action of alloxan and on the course of alloxan induced diabetics as well as the effect of combination of corticotrophin with insulin on desiccated thyroid with insulin on the course of alloxan diabetes in albino rats has been studied. Pre-treatment with insulin or cortocotrophin has no effect on the diabetogenic action of alloxan or on the course of alloxan induced diabetics in albino rats. Pre-treatment with insulin appears to increase the sensitivity of the rats to diabetogenic action of alloxan. Insulin or corticotrophin or their combination do not ameliorate the alloxan induced diabetic condition in any way. Desiccated thyroid feeding for short time shows some protective effect against the diabetogenic action of alloxan reatment with desiccated thyroid one causes recovery of one out of animals from alloxan induced abetics. The combined insulin d thyroid treatment, however, ows better effect and 50 per cent the animals recovered from loxan induced diabetes.

Nicotinic acid - tryptophan etabolism in man, by Agarwal, . S., Chatterjee, K. P. and Banere, S., *Indian J. med. Res.*, 1958 5 (3), 431.—Twenty-four-urinary cretions of nicotinic acid and nide, quinolinic acid, N′-methylicotinamide, 6-pyridone, tryptohan, kynurenin, anthranilic acid d 3-hydroxynathranilic acid were etermined in 10 adult men before d after the feeding of 5 g. DL—yptophan, on two consecutive ays. Normally, urine contained icotinic acid and amide, quinolinic cid, N′-methylnicotinamide, 6-yridone and tryptophan and exretions of these metabolites were creased after the feeding of tryptophan. The increase in the excreon of 6-pyridone was maximum. ynurenin and 3-hydroxyanthrailic acid which were absent in rine appeared after the feeding of ryptophan. Anthranilic acid could ot be estimated in the urine ven after the administration of ryptophan.

Studies on protein and carbohydrate metabolism as affected by vitamin B_{12} and folic-acid deficiency in rats, by Mukherjee, M. and Banerjee, S., *Indian J. med. Res.*, 1958, **46** (3), 435.—Combined deficiency of vitamin B_{12} and folic acid was produced in weanling rats by feeding a diet deficient in the above vitamins and containing odinated casein and sulfasuxidine.

The urinary excretions of different nitrogenous constituents, such as non-protein N, urea N, uric acid, amino acid N, creatinine and creatine, were estimated during the progress of the combined vitamin deficiencies. All the nitrogenous constituents except creatine were excreted in increased amounts in vitamins-deficient animals.

Glucose, total protein and non-protein N content of blood and total protein contents of liver were determined in normal and deficient animals. No change in protein content of blood and liver could be obtained in the deficient animals. The non-protein N of blood was high and the fasting blood sugar level was low in the deficient animals.

Glucose content of the blood 2½ hours after the oral administration of glucose was determined in the normal and deficient animals. While, in normal animals the blood sugar value was similar to the fasting blood sugar value, the same in deficient animals was significantly higher.

Glycogen content of liver and muscle was determined both before and 2½ hours after the oral administration of glucose in both the normal and deficient animals. The deficient animals showed a very low glycogen content in the liver which did not increase after the administration of glucose. The muscle glycogen of the deficient animals was unaffected and did not change after the administration of glucose.

Implications of these observations have been discussed.

Effect of dietary protein, calories and pyridoxine on glutamate-oxaloacetate transaminase activity of blood, by Tulpule, P. G. and Kshirsagar, S. B., *Indian J. med. Res.*, 1958, **46** (3), 452.—The effect of protein, pyridoxine and calorie deficiencies on blood glutamate - oxaloacetate transaminase (GOT) activity have been studied in albino rats.

The dietary regimens studied were: (*i*) adequate protein with and without pyridoxine, (*ii*) low protein, with and without pyridoxine, and (*iii*) low protein, restricted calories with and without pyridoxine; all for a four week period. During the repletion period, missing nutrients were restored to the diet in the respective groups of animals.

GOT activity in whole blood was studied at weekly intervals in all the experimental animals.

Feeding of low protein or pyridoxine deficient diets was followed by a lowering of the blood concentration of GOT. When the missing nutrient was added to the diet the enzyme activity returned to normal in two to three weeks. During depletion as well as on realimentation, the effect of pyridoxine was progressive and relatively more lasting than that of protein.

The superimposition of calorie restriction on protein deficiency did not seem to have beneficial effect on blood GOT.

FRUIT AND VEGETABLE PRODUCTS

Chemical constituents of different varieties of mangoes (*Mangifera indica*), by Nandi, D. L., *Sci. & Cult.*, 1958, **23** (11), 618.—Seven Indian varieties of mango have been analysed with a view to studying the effect of stage of ripening and the variety on the composition. The values vary greatly from variety to variety and also stage of ripeness. The range of values reported are as follows: moisture, 77.1-86.0; total acidity (N. NaOH/100 g.), 2.2—12.2; reducing sugar, 4.96-11.71; total sugar, 9.69-20.51; protein, 0.63-0.92; fat, 0.062-0.156 per cent; carotene, 0.36—18.73 p.p.m., and vitamin C, 13—176 mg/100 g. All the varieties contained traces of thiamine. Mangoes have a fairly high food value, and of the varieties studied, *Langra* has the highest food value. It contains an exceptionally high content of vitamin C, 176 mg/100 g. The study on the effect of stage of ripeness on composition with one variety has shown that total acidity decreases and total sugar increases with the process of ripening.

K.L.R.

Some aspects of food canning-5, by Little John, G. S., *Indian Food Packer*, 1957, **11** (11), 5.—This is the fifth article by the author in the series. The author describes briefly the role of cannery hygiene, need for keeping initial infections at a very low level by using fresh, clean raw materials, and keeping a close check on such ingredients as sugar, flour and spices to ensure that they are not heavily contaminated with heat resistant spores, and the need for immediate processing after sealing, sources of contamination from factory equipment, etc. A scheme is also presented for the daily-cleaning of plant and equipment.

L.N.S.

INSECTICIDES

Search for new insecticides, by Tiwari, S. S. and Tripathi, B. N., *J. Indian chem. Soc.*, 1958, **35** (2), 147.—The insecticidal activity of 2-allyloxy—and 2-*o*-chlorobenzyloxy-4:5-dimethyl alkyl ketones and of 2-allyloxy-4:6-dimethyl alpha-furophenone has been assessed using common house-flies. The compounds were diluted in mineral turpentine to 1 per cent (w/v) strength and 0.2 c.c. of the solutions was sprayed into glass jars, standing on a revolving table, covered by mosquito netting and containing 20 test-flies per test. The time required for 50 per cent and 100 per cent knock-down of the flies was recorded. The experiment was repeated with standard insecticides *viz.*, DDT, BHC, and pyrethrin I and II. Of the 13 compounds studied, only 2-*o*-chlorobenzyloxy-4:5-dimethyl propiophenone and 2-allyloxy-4:6-dimethyl-alpha-furophenone exhibited maximum activity producing 50 per cent and 100 per cent mortality in 3 and 7.5 min. in the former and 3.5 and 9.0 min. in the latter respectively. These two compounds were more active than DDT and BHC.

K.L.R.

MICROBIOLOGY

Glucose metabolism in *Streptomyces griseus*, by Raghavendra Rao, M. R., *J. sci. industr. Res.*, 1958, **17 B** (4), 53.—Studies of the effect of inhibitors on the growth of *S. griseus*, streptomycin formation and glucose oxidation have shown that (1) arsenate affects the first two activities, (2) arsenite and iodoacetate inhibit all the three activities, (3) fluoride seems to enhance slightly streptomycin yield without much effect on the other two activities, and (4) DNP enhances the oxidative activity markedly.

Various intermediates of the E.M.P. pathway and of the TCA cycle have been tested for their oxidizability by cell suspension and the results obtained are inconclusive.

All the enzymes of the EMP pathway, except triosephosphate isomerase (not tested for its presence), have been shown to be present in the cell-free extracts of *S. griseus*. Besides, aconitase, TPN, isocitric dehydrogenase and diaphorase have been demonstrated in the extracts.

Search for new antibacterial compounds. Part II. Evaluation of the antibacterial activity of new phenols, by Tiwari, S. S., Mukherji, A. and Tripathi, B. N., *J. Indian chem. Soc.*, 1958, **35** (2), 110.—Various 2-alkyl-3-methyl-6-*tert*-butylphenols and 2-alkyl-4-tert.-butyl-6-chlorophenols have been tested for their bacteriostatic action against *streptococcus haemolyticus*, *Staphylococcus aureus*, *Pseudomonas pyocyaneous*, *Salmonella typi*, and *Bacillus subtilis*. The phenols were dispersed in 3 per cent agar medium at 50° C and dilutions of 1/100, 1/500, 1/1000, 1/2000, 1/5000 and 1/10,000 were used against the microorganisms. Among the butyl and chloro phenols studied, 2-butyl-3-methyl-6-*tert.*-butylphenol, 2-butyl-4-*tert.*-butyl-6-chlorophenol and 2-octyl-4-*tert.*-butyl-6-chlorophenol were found to be highly reactive and inhibited the growth of *S. haemolyticus* and *S. aureus* even in very low dilutions of 1/5000 and 1/10,000. The above three compounds had a Rideal-Walker co-efficient of 6.5, 2.6 and 2.6 respectively.

OILS AND FATS

On the reclamation of rancid fats, by Saha, J. G., Roy, P. and Chakrabarty, M. M., *J. Indian chem. Soc., Ind. & News Ed.*, 1957, **20** (1), 25.—Aluminium-magnesium silicates and activated carbon are known to decrease the peroxide value of olive oil and rancid fats have been regenerated by alkali refining followed by bleaching with activated earths. The effects of the adsorbents *viz.*, activated bentonite, Fulmont earth 511 C, activated carbon and silica gel on groundnut oil and rancid *ghee* have been studied. The fats were neutralised and then subjected to absorbent treatment. The influence of various factors such as treatment with adsorbent under vacuum (0.5 mm. of Hg), CO_2 atmosphere or at room temperature, action of alkali refining, time of contact with adsorbent, and nature and concentration of the adsorbent has also been investigated. The P.V. of the reclaimed oil has been determined by Lea's method in each case. The results show that treatments under vacuum and under CO_2 atmosphere are of equal efficiency. Alkali refining does not exhibit any marked difference in the reduction of P.V. as compared to the treatment of the oil in the unneutralised state with the adsorbent. Increasing the time of contact from ½ to 1 hour did not produce great positive effect. Of the adsorbents studied, activated bentonite is found to be the best. It has also been observed that successive treatments with adsorbent is a much more efficient process than treatment of the rancid fat with the whole bulk of the adsorbent at one stage. The percentage loss of fat in the former case would, however, be greater than in the latter case.

K.L.R.

The component fatty acids of *Argemone mexicana* seed oil (Indian), by Chakrabarty, S. R. and Chakrabarty, M. M., *J. Indian chem. Soc., Ind. & News Ed.*, 1957, **20** (1), 33.—*Argemone mexicana* is a plant belonging to the Papaveracea family and its seeds, which resemble mustard seeds in appearance, contain about 36 per cent oil having an acrid odour and bitter taste he composition of argemone oil om Indian seeds, as determined the modern methods is reported. he characteristics of the oil are: id value, 3.0; saponification equilent, 288.6; iodine value, 124.0; on-saponifiables (by wt), 1 per cent d refractive index 1.4649. The ixed fatty acids (90.32 g., and I.V. 8.3) have been resolved by low mperature crystallisation technie into three fractions having fferent iodine values. The comonent acids of the three fractions ve been determined. The comsition of mixed fatty acids of the l reported in the present work is as llows: myristic, 0.82; palmitic, .54; stearic, 3.75; arachidic, 0.98, eic, 18.48 and linoleic 61.43 per nt Mol. These values have been mpared with those reported in e literature. Ricinoleic acid, rerted to be present by earlier orkers, has been shown to be sent. The *A. mexicana* oil could ofitably be used as drying oil, as ell as for soap making and hydronation industry.

K.L.R.

A review of the research work one so far on the effect of orage on mustard and linseed ils, by Om Prakash, Sharma, T. R. d Saxena, S. C., *Indian Oilseeds* , 1958, **2** (2), 94.—The AA ave reviewed in this paper the ork done so far on the storage ehaviour of mustard and linseed oils. The effects of storing the oils under natural conditions, and in different containers, addition of antioxidants, inhibiting the absorption of oxygen by the oils using catalysts, constant agitation during storage, refining etc., on the keeping and organoleptic qualities of the oils have been reported. The broad conclusions that can be arrived at from the results given are as follows: (1) vegetable oils, in general, and mustard oil in particular should not be stored in galvanised iron containers, (2) the oils should be stored in the dark or in amber coloured glass containers so that the action of light on them is minimised, (3) hydroquinone is the most effective antioxidant that can prevent development of rancidity, (4) organoleptic evaluation is still superior to more objective tests for the detection of the degree of rancidity in the oils and (5) abnormally high humidities (above 75 per cent) should be avoided during the storage period. 21 references are given.

K.L.R.

Component fatty acids of the seed fat of *citrus aurantium* or Karna khatta, by Dhigra, D. R., Gupta, G. N. and Agarwal, R. P., *Indian Soap J.*, 1957, **23** (4), 67.—Citrus fruits are widely grown in India which produces about 13.37 million maunds (1 md.=82.5 lb.) of the fruits grown in an area of 1,30,001 acres. The seeds of citrus fruits are at present a waste product and form 2-3.2 per cent of the weight of the fruit. An oil has been obtained from the seeds of *Karna khatta*, one of the species of citrus fruits grown in U.P., by decorticating them, crushing and extracting them with petroleum ether. The ether is removed by distillation under vacuum and the oil is recovered. The oil content is 44.86 per cent on decorticated seeds and it is a light pale oil with a pleasant odour. The characteristics of the oil determined are: saponification value, 238.7; saponification equivalent, 235.0; iodine value, 86.05; acid value, 4.36; refractive index (20°C), 1.46486 and specific gravity (20°C), 0.9236. The AA have fractionated the oil and determined the fatty acid composition which is as follows: oleic, 7.96; linoleic, 54.18; myristic, 0.74; palmitic, 14,18; stearic, 19.32, arachidic acid, 1.21 and unsaponifiable matter, 2.41 per cent. The extracted cake is a rich source of protein, phosphores-and iron and can be used as a good cattle feed. The cake contains 3.97 per cent nitrogen, 24.81 per cent protein and 2.65 per cent ash. The components of the ash are SiO_2, 0.05; Al_2O_3 and Fe_2O_3, 0.7; CaO, 0.14; MgO, 0.07 and P_2O_5, 1.25 per cent. As the oil has a pleasant odour and is not bitter, it can be used for medicinal and edible purposes. K.L.R.

PART III (Foreign)

NALYTICAL

Determination of unoxidized ocopherols in milk fat, by andwerk, R. L. and Bird, E. W., . *Dairy Sci.*, 1958, **41**, (1),28.—his procedure was evolved in rder to follow tocopherol degradaion in oxidising milk fat. It ombines saponification, in the resence of pyrogallol, to destroy ocoquinones and essentially all at peroxides, chromatography on nCl_2 + HCl - treated Floridin Kjolhede) to remove carotenoids, ossible residual peroxides, steroids, etc., and colour development in benzene-ethanol with ferric chloride and bipyridyl in acetic acid solution (Devlin and Mattill). Pyrogallol was effective in preventing tocopherol destruction during saponification and was superior to saponification under nitrogen. Complete saponification was effected by using 17 ml. of 3.5 N KOH per 10 g. fat. If saponification was eliminated, the treated Floridin column reduced tocopheryl - p-quinones but not tocopheryl-o-quinones. The former were similarly reduced by the Quaife and Biehler hydrogenation procedure. These reduced compounds are measured as tocopherols.

A revised thiochrome procedure for the determination of thiamine in cereal products, by Bechtel, W. G. and Hollenbeck, C. M., *Cereal Chem.*, 1958, **35** (1), 1.—A procedure for the determination of thiamine in all cereal products is presented. This improves and simplifies the procedures given in the sixth edition of *Cereal Laboratory Methods*. In studies leading to the development of the new procedure it was found that drying the sample has no effect on the efficiency of extraction of thiamine, that sulfuric acid is a more convenient extracting agent than acetic acid, and that enzyme level and temperature can be selected to give a digestion of any desired time. A rapid method is given for activating Decalso. A Decalso column 3 cm. high is entirely adequate to adsorb thiamine. This permits discarding Decalso after a single use, thus eliminating its purification and reactivation. Results from three series of collaborative tests of a wide variety of cereal products show that the new procedure gives results at least equal in precision to those of other methods.

BIOCHEMISTRY AND NUTRITION

Cystine, tyrosine and essential amino acid content of selected foods of plant and animal origin, by Edwards, C. H. and Allen, C. H. *J. agric. Fd. Chem.*, 1958, **6** (3), 219.—Twenty foods commonly consumed in the United States have been analysed for 12 amino acids, total nitrogen, moisture, and ash. Using whole egg as a standard to evaluate the foods, on the basis of 100 grams, corn-soya, cottage cheese, and liverwurst were rated as excellent suppliers of the essential amino acids, with few exceptions. However, when menus cannot be based on protein of excellent quality, diets should be planned to include, simultaneously, two or more foods rated as good or fair sources of the amino acids.

Growth and reproduction of rats on diets of evaporated milks and a vegetable fat milk product, by Ney, L. F., *J. agric. Fd. Chem.*, 1958, **6** (3), 223.—Growth and reproduction studies were carried out with rats to compare the nutritive value of an experimental vegetable fat milk product with a conventionally processed and a high-temperature, short-time processed evaporated milk. Weanling rats maintained on the milk diets with minerals added grew well for 12 weeks. Second and third generations were successfully reared on the milk diets. Judged by the criteria of weight gain and production performance, the milk product made from non-fat milk solids, vegetable fats, and water, and fortified with vitamins, was somewhat better nutritionally than the other two milks. The poorest performance was shown by the rats fed the conventional evaporated milk, which appeared to be inadequate to meet the needs of female rats during repeated gestation and lactation.

Concentration and hydroxylation of free phenylalanine in adrenal glands, by Fellman, J. H. and Devlin, *Biochim. Biophys. Acta*, 1958, **28**(2), 328.—Phenylalanine has been found to be present in the free state in the adrenal glands of beaf, rabbit, guinea pig, spider monkey, rat and man by paper-chromatography. Chemical determinations showed that large amounts of the amino acid are present in the adrenal tissues. Medullary tissue has a greater amount of phenylalanine than the cortical tissue. This amino acid plays a role in epinephrine biosynthesis. Chromatographic studies with beef-adrenal medulla showed that phenylalanine is hydroxylated by the adrenal tissue by a mechanism similar to the chemical hydroxylating system of Udenfriend and co-workers. The significance of these findings to aromatic hydroxylation products found in normal urine and those isolated from the urine of individuals afflicted with phenylpyruvic oligophrenia has been discussed.

K.L.R.

Adenosine mono-, di- and triphosphate, pyruvic kinase, hexokinase and polynucleotide phosphorylase assay, by Grisolia, S., Mokrasch, L. C. and Hospelhorn, V. D., *Biochim. Biophys. Acta*, 1958, **28** (2), 350.—Methods have been described for the determination of adenylic acid, adenosine mono-, di- and triphosphate pyruvic kinase, hexokinase and polynucleotide phosphorylase. A series of reactions on which the depend is given and they i the colorimetric estimation of pyr vate, which is a component fo in the reaction series. The pr dures are very sensitive, simple and reasonably speci As a low concentration of 0.0 mole or less per ml. of acid, adonesine di-and triphosph can be assayed by these technic Some of the limitations of methods proposed, have been cussed. They are, however, e applied to optically opaque solut and because of the ease of handli the accurate temperature cont and the large number of samp that can be assayed at the same tim they offer definite advantages o other excellent methods used present such as the manometr method for estimation of hexokinas or the optical method for nucleoti phosphorylase.

K.L.R.

CEREALS

The cooking properties of some new durum wheat varieties, by Harris, R. H. and Sibbitt, L. D., *Food Technol.*, 1958, **12** (2), 91.—Macaroni made from 12 samples of durum wheat grown in experimental plots at North Dakota stations in 1954, 1955 and 195 was evaluated for cooking quality. Principal quality properties measured were cooked weight, degree of disintegration and tenderness score. From this investigation it seems that macaroni toughness, as indicated by tenderness score, increases with protein content. There was marked differences between durum wheat varieties in dough mixing requirements. Variations in tenderness score were also marked but smaller than for mixing requirements. As expected, semolina protein content was very significantly affected by wheat variety, location of growth, and year growth. Of these, location growth had the most pronounced effect, and year of growth the le For cooked weight, variety exerted a significant influence; residue, variety was without effect.

ars having the largest influence. r tenderness score, location and ar of growth had approximately ual effects, while variety was less fluential.

AIRY PRODUCTS

Separation, concentration, d properties of alpha-amylase om cow's milk, by Guy, E. J. d Jenness, R., *J. Dairy Sci.*, 58, **41** (1), 13.—The presence in ilk of *a*-amylase was confirmed. nalyses for the enzyme in milk d fractions thereof were made by easuring the rate of decrease in scosity of starch paste with Ostald viscosimeters. Analysis of ilk and that dialyzed with various lded salts revealed that the enzyme quires both calcium and chloride r activity. When milk proteins ere fractionated, much of the nylase activity was concentrated to the lactoglobulin fraction prepitated from whey at 43 per cent turation with $(NH_4)_2\ SO_4$. The nzyme was further concentrated dissolving the lactoglobulin in a lvent consisting of ethylene glycol, hanol, and water in the ratio of :29:56 by volume, adsorbing it on rice starch and eluting with turated $CaSO_4$ solution. A prearation with 30 times the specific tivity of lactoglobulin and conining 20% of the total activity of e lactoglobulin from which it was repared, had starch liquefying, extrinizing, and saccharifying properties. The optimum pH for the nzyme was 7.4 at 34° C. The nergy of activation of the catalyzed action, measured by starch liquection, was 8,500 calories per mole. he enzyme was progressively activated by 30 minutes-heating etween 45 and 52° C. at pH 6.4. plot of velocity vs. velocity/ ubstrate concentration was linear, ndicating a single enzyme entity.

Effects of reducing rennet and dding calcium chloride on the nanufacture and curing of heddar cheese, by Ernstrom, . A., *et al.*, *J. Dairy Sci*, 1958, **41** 1), 61.—This study showed the ack of read benefits derived from using low levels of rennet with added calcium chloride in the manufacture of Cheddar cheese.

Cheese was made from raw and pasteurized milk during four seasons. Each lot of cheese consisted of three vats to which 90, 45, and 45 ml. rennet per 1,000 lb. of milk was added, respectively. The third vat of milk was further treated with 0.02 per cent calcium chloride. The cheese was cured at 50°F. for 36 weeks. Using subnormal amounts of rennet delayed curd formation in both raw and pasteurized milk. Adding 0.02 per cent calcium chloride with one-half normal amounts of rennet gave normal curd formation and yield, but protein breakdown was slow, and curdiness persisted longer in the finished cheese. The quality of the cured cheese was not influenced by variations in the rennet and calcium chloride used, but persistence of curdiness was undesirable in young cheese made with reduced levels of rennet, especially when supplemented with calcium chloride.

FISH

Comparative effectiveness of tetracycline antibiotics for fish preservation, by Boyd, J. W., *et al.*, *Food Technol.*, 1958, **12** (2), 108. —Previous work, which was based largely on differences obtained in storing ground fish samples in which antibiotics were incorporated, indicated that chlortetracycline (C.T.C.) was more effective than oxytetracycline (O.T.C.) or tetracycline (T.C.) in retarding bacterial spoilage. The comparative effectiveness of these 3 antibiotics has now been assessed, using different species of fish and the following practical methods of application: (1) incorporation of 5 p.p.m., of the antibiotic in the ice used for icing fish; (2) addition of 1-2 p.p.m. in chilled 3 per cent salt solution used for holding evisecrated fish; and (3) addition of 5 p.p.m. to solutions used for dipping fillets. The results showed that C.T.C. was more effective than the other two tetracyclines in retarding bacterial spoilage of treated fish.

Volatile acids, succinic acid, and histamine as indices of decomposition in tuna, by Fred Hilling *J. Assoc. off. agric. Chem.*, 1956, **39** (3), 773.—Canned tuna prepared from fish in good condition normally contain a small quantity of volatile acid which has been identified chromatographically as acetic acid. As decomposition progresses, there is a steady increase in acetic and formic acids. When decomposition is further advanced, propionic and butyric acids may appear. The results indicate that individual volatile acids in canned tuna are a good index of the stage of decomposition of the raw material from which the canned product was prepared. Succinic acid and histamine may be formed as the fish decompose. Some of the indices are partially lost during the canning process. However, this loss is not sufficient to cause a decomposed fish to become passable solely on the basis of chemical analysis. The canning process does not produce any increase in any of the indices in passable fish. More than one index of decomposition is desirable in order to control all types of decomposition that fish may undergo.

Effect of storage on decomposed canned shrimp, by Barry, H. C., *et al.*, *J. Assoc. off. agric. Chem.*, 1956, **39** (3), 801.—Canned shrimp of various grades and combinations of grades were stored for a two-year period. Organoleptic and indole determinations were made on portions of the pack at the stated intervals of time.

The following conclusions were reached:

(1) The indole content of canned decomposed shrimp tends to decrease after storage periods of several months.

(2) The odors associated with decomposition are less recognizable as storage age increases.

(3) Canned shrimp, 100 per cent decomposed before canning, undergo a colour change from the typical orange-red of canned shrimp to yellow-brown during the months

of storage. This colour change cannot be used to pick out decomposed shrimp admixed with passable shrimp, all of which retain their colour during storage.

(4) The majority of the organoleptic panel were able to recognize canned shrimp as decomposed only when 20 per cent Class 2 decomposed shrimp or 10 per cent Class 3 decomposed shrimp was present.

Drying fish and beef prior to solvent extraction, by Arnold, L. K. and Hsia, P. R., *J. agric. Fd. Chem.*, 1958, **6** (3), 231.—The fat in fresh meat, such as beef or fish, containing a normal amount of moisture is extracted very slowly by solvents. Both fresh beef and fish were freeze dried and solvent extracted in glass extraction-rate apparatus at four temperatures. Ethyl alcohol-dehydrated beef was similarly extracted. The meat dehydrated, by both freeze drying and ethyl alcohol, extracted much more readily than either fresh meat or meat dried in a conventional laboratory drying oven.

FRUIT AND VEGETABLE PRODUCTS

Factors influencing drained weight of canned cling stone peaches, by Leonard, S., Luh, B. S. and Mrak, E. M., *Food Technol.*, 1958, **12** (2), 80.—Factors influencing drained weight and Brix readings of canned, halved cling stone peaches were investigated. These include storage time, concentration of cover syrup, fill weight, maturity, and the use of corn syrup in place of sucrose. Immediately after canning, the drained weight fell below the fill weight because peach fluid was lost to the cover syrup. Drained weight increased rapidly during the first week after canning and then slowly until a maximum value was reached in 90 days as a result of penetration of syrup into the fruit. Right after canning, the drained weight was only 89 per cent of the fruit fill weight. The weight retention after 30 and 90 days' storage was 99.0 per cent and 101.5 per cent of the fruit fill weight, respectively. Concentration of sucrose in the cover syrup was found to have a pronounced effect on the equilibrium drained weight of the canned product. Samples canned in sucrose syrups of 40° Brix or lower yielded drained weight higher than the fill weight. Those canned in 50° Brix or higher yielded drained weight lower than the fill weight. For peaches canned in water for dietetic purposes, a weight retention of 103.7 per cent was obtained at equilibrium. The influence of maturity on drained weight is small as compared with other factors. Replacing sucrose with 64 dextrose-equivalent corn syrup in the cover syrup caused no significant difference in drained weight of the canned product at equilibrium.

The importance of syrup concentration, fill weight, and storage time to drained weight and Brix readings is discussed.

Clumping in canned blue berries, by Powers, M. J., *et al.*, *Food Technol.*, 1958, **12** (2), 99.—Canned blue berries may vary from a highly attractive, free-flowing product to one that is clumped into a firm mass. Severely clumped berries are less desirable, more difficult to use, and separation often results in torn skins and unattractive pulp. The tendency of some varieties to clump when canned was studied by canning trials and by chemical and histological observations. Clumping can be greatly reduced by cooling under agitation, which apparently interferes with the binding together of berries by surface wax or cutin.

Effect of pH and type of amino acid in dilute sugar solutions, by Willits, C. O., Underwood, J. C., Lento Jr., H. G., and Riccinti, C., *Food Res.*, 1958, **23** (1), 61.—With a view to studying the browning machanism as applied to maple sap, the major constituents of which are sugars, the AA have conducted a number of experiments on model systems of dilute glucose solution under a variety of pH conditions with or without amino acids. T have also examined the effect of p and individual amino acids glucose solutions and the mixtu of amino acids at different levels concentration on the browning 0.025 M glucose solution heat for 20 minutes at 114° C. Th results show that glucose solut with no amino acids develop co only when their pH exceeds thus pointing to the importance alkaline medium as a pre-requi for significant browning. Relativ to the control of pH, alanine o glutamic acid did not bring abou any significant increase in colour However, the presence of lysin displayed more browning at pH and above and also caused the formation of a small amount of colou even at pH 6. It is pointed ou that lysine and alkaline pH have a synergistic effect on the amoun of colour developed. But, the amino acids do not play any role in the browning of maple syrup an the effect of pH on the hexoses in the syrup are considered to b primarily responsible for the browning reaction.

B.V.S.

Effect of the position of amino group in the acid molecule in dilute glucose solution, by Lento Jr., H. G., Underwood, J. C. and Willits, C. O., *Food Res.*, 1958, **23** (1), p. 68.—The AA have tried to study the effect of amino acids containing one or two amino groups on the development of colour in glucose solutions at pH 8. The greatest increase in colour occurred with the 6-carbon diamino acid. lysine. The mono-amino acids having the amino groups at the end of the chain caused varied changes in the development of colour, while those amino groups in the L-position had practically no effect irrespective of the chain length. However, the mono-amino acids increased or decreased the colour formation as the chain length increased from 2 to 4 carbon atoms or 5 and 6 carbon atoms respectively

B.V.S.

A method for the characteris- s of pectin substances in some iit and sugar-beet marcs, by e, M., Elizabeth A. McComb McGready, R. M., *Food Res.*, 58, **23** (1), 72.—Details are en here of an experimental pro- lure for determining quantita- ely the total amount of pectic bstances without extraction from plant tissues and for characteris- partially of their chemical ture. These high molecular ight carbohydrate polymers ich are associated with insoluble llular material cannot be extract- completely without changing eir chemical composition and nce this study. Samples of en different fruit and vegetable rcs obtained by removing soluble bstance with acidified dilute anol or acetone are used for alysis.

B.V.S.

A new colorimetric method r pyrethrins, by Williams, H. L., *al., J. Assoc. off. agric. Chem.*, 56, **39** (3), 872.—A new colori- etric method has been developed the determination of pyrethrins. is based on the measurement of red colour produced when rethrins are heated with a reagent nsisting of 80 per cent ortho- osphoric acid and 20 per cent yl acetate.

The colour is stable indefinitely d appears to be fairly specific for rethrins.

Piperonyl butoxide suppresses e pyrethrins colour; however, it n be separated from pyrethrins by romatography.

Determination of endrin in ricultural products and ani- al tissues, by Bann, J. M., *et al.*, *agric. Fd. Chem.*, 1958, **6** (3), 6—The use of endrin on crops at subsequently may be consumed man or domestic animals necessi- ted the development of methods pable of accurately determining sidues of this material in concen- ations in excess of 0.1 p.p.m., in crops and animal products. A sensitive method for the colorimetric determination of endrin, with phenyl ozide and diazotized sulfanilic acid as the analytical reagents is described. As little as 5γ of endrin can be measured. Suitable procedures are given for isolation of endrin from agricultural products and animal tissues in a form satisfactory for application of the method. Thirty different crops or biological materials have been analysed successfully by the method. Apparent endrin values on untreated samples range from 0.01 to 0.1 p.p.m.

Determination of *m*-dinitrophenyl pesticides, by Calvin Menzie, *J. agric. Fd. Chem.*, 1958, **6** (3), 212.—A simple and rapid method for spectrophotometric determination of *m*-dinitrophenyl pesticides is based on their reaction with potassium cyanide. The reaction is sensitive to 2 Y of active material and specific for the *m*-dinitro structure. The developed colour is stable and obeys Beer's law over a wide range. The use of this reaction in determining D.D.T. methoxychlor, or B.H.C. is suggested, and a colour reaction was demonstrated. Its use in the determination of other *m*-dinitro compounds is also suggested.

MEAT

Shrinkage and organoleptic characteristics of beef aged in controlled environments, by Sleeth, R. B., Kalley, G. G. and Brady, D. E., *Food Technol.*, 1958, **12** (2), 86.—The effect of various temperature, humidity, air flow, and ultraviolet radiation conditions has been studied on paired beef quarters and wholesale cuts of different weights and grades. Determinations were made of shrinkage, colour, drip loss, and cooking loss; organoleptic responses reflecting the differential effects of the various aging treatments were studied. Effect of the different treatments on sensory values of rib and round steaks after 2, 4, 8 and 12 months' storage at 0° F has been ascertained. A method of predicting shrinkage. and organoleptic characteristics of beef aged under controlled environmental conditions is presented.

STORAGE

Grain storage studies XXVI. Fungus invasion and deterioration of wheats stored at low temperatures and moisture contents of 15 to 18 per cent, by Papavizas, G. C. and Christensen, C. M., *Cereal Chem.*, 1958, **35** (1), 27.—Samples of white wheat, not inoculated with fungi and inoculated separately with different species of fungi known to cause deterioration of stored grains, were stored at low temperatures and moisture contents of 15-18 per cent and evaluated periodically for viability, brown germs, and percentage of seeds invaded by fungi. Inoculated and stored for 12 months at a moisture content of 15.0-15.5 per cent and temperature of 5° and 10°C., the wheat did not decrease in viability and the germs remained light-coloured. When stored at a moisture content of 16.0-16.5 per cent, the wheat was extensively invaded by fungi at both 5° and 10°C., viability of the seed decreased, and the germs of many seeds became known. Stored at a moisture content of 16-18 per cent for 19 months, the seeds at -5°C. were not invaded by fungi, and remained sound, and of high viability; at 5° and 10° C., many seeds were invaded by fungi, and the germs died and developed the brown colour typical of sick wheat. Noninoculated controls which remained free of storage fungi remained sound and of high viability. The evidence suggests that wheat with a moisture content up to 16 per cent may be stored without obvious deterioration for a year at a temperature of 10°C. or below, and wheat with a moisture content up to 18 per cent may be stored safely for as long as 19 months at a temperature of -5°C.

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BROWNING IN SOME PRESERVED FRUIT PRODUCTS

By B. S. Bhatia, N. S. Kapur and G. S. Siddappa

(Central Food Technological Research Institute, Mysore)

Non-enzymatic browning in model systems been studied by several workers[1-6]. Darken- effect in processed Nagpur orange juice ring storage has also been reported[7]. The chanism is not completely understood so although 5-hydroxymethyl 2-furaldehyde MF) which has a peak at 282 mμ has been ected to be a common precursor in most of the it products.

n the course of an investigation on preserved nge juice in which case also a similar peak ition was observed, it was of interest to deter- ne the peak position and also browning in case of some important tropical fruit products. e results are presented in this paper.

Material and Methods

Samples of juice from Coorg and sathgudi nges, squashes from jack fruit, musk melon, aya and amla and canned Coorg orange ments, which had been packed under different atments and stored at room temperature for years were used in this investigation. The ectra of the filtered diluted solution of the nples were taken in the region 220-330 mμ d 400-650 mμ at 5 mμ intervals with the help of a Beckman's DU Spectrophotometer. For the sake of brevity the optical density at 420 mμ and at peak position in the region of 282 mμ are only taken into consideration.

The observed optical density at peak position was converted[8] into equivalent HMF making use of the equation: E (Mol. Extn. Coeff. $= 14.6 \times 10^3$) and expressed as total carbonyl compounds, p.p.m. of the original undiluted sample. The results are thus directly comparable. Since there was no peak in the region 400-650 mμ and also absorption at 420 mμ is generally measured for comparison of the degree of browning, in this case also the optical density at 420 mμ was calculated for the original undiluted sample from the observed values for the diluted samples. The samples were diluted such that the observed value for optical density was in the region 0.300 to 1.800.

Results and Discussion

Data regarding bottled Coorg and Sathgudi orange juices are given in Table I and for other fruit products in Table II.

Table I. *Browning in bottled Coorg and Sathgudi orange juice (stored at 24–30°C for 66 months).*

Sl. No.	Particulars	Total carbonyl compounds calculated as HMF (p.p.m.)	
		Coorg	Sathgudi
1	+ 0.05 % NaCl & pasteurized ...	307	412
2	+ 5 % sugar ,, ...	393	500
3	+ 5 % lime juice ,, ...	407	307
4	+ 0.35 % citric acid ,, ...	422	508
5	Juice 1/4th neutralized ,, ...	204	412
6	+ 5 % lime juice + 700 p.p.m. SO_2 ...	379	570
7	Heated juice + do ...	441	379
8	Juice + 1000 p.p.m. sodium benzoate ...	546	623
9	Juice pasteurized ...	307	...
10	Deaerated + 2.4 ml. of 3 N solution of sodium citrate per lb. & pasteurized ...	249	...
11	Juice deaerated & pasteurized...	332	309
12	+ 0.5% amla ,, ...	785	514
13	Juice from lyepeeled segments pasteurized ...	298	...

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Table II. *Browning in other fruit products*

Product	Treatment	Storage period months	Optical density at 420 mμ of original sample (calculated)
1. Jack fruit squash (50° Brix)	With 350 p.p.m. SO_2	50	2.350
2. ,, ...	,, ,, + 150 mg% ascorbic acid	,,	2.500
3. ,, ...	,, 1000 p.p.m. Sodium benzoate	,,	3.040
4. ,, ...	,, ,, + 50 mg. % ascorbic acid	,,	3.800
5. ,, ...	,, + 150 mg. % ascorbic acid	,,	14.250
6. ,, ...	Flash pasteurized at 190–200°F for 1–2 mts.	,,	13.500
7. Musk melon squash (50° Brix)	With 350 p.p.m. SO_2	83	1.840
8. ,, ...	,, 1000 p.p.m. Sodium benzoate	,,	2.800
9. ,, ...	Pasteurized	,,	2.350
10. Papaya squash (50° Brix)	With 350 p.p.m. SO_2	,,	2.900
11. ,, ...	,, 1000 p.p.m. benzoate	,,	6.750
12. Amla squash (50° Brix)	,, 350 p.p.m. SO_2	,,	25.000

In all cases the peak was observed around 282 mμ except in the case of samples containing *amla* extract, where it was around 275 mμ. This might perhaps be due to the marked effect of the tannins present in *amla* which have a peak in this region. In the case of freshly prepared samples there is no absorption maximum in the region 220-300 mμ or 400-650 mμ indicating thereby the absence of brown precursors like HMF. All samples developed these maxima only after long storage.

In general it was observed that although an increase in the total carbonyl compound value was followed by an increase in the calculated value of optical density at 420 mμ, there was no exact proportionality between the two sets of values. This explains the fact that the values at 282 m peak denote a true measure of HMF, but at 420 mμ, the values represent the overall effect of several substances which contribute towards darkening. In the case of canned Coorg orange segments, the peak position was maintained at 282 mμ, but the HMF values were 920 and 326 p.p.m., respectively for the unpeeled and lyepeeled segments canned in 55° Brix syrup and stored at temperature for 66 months.

Taking into account the values of HMF, following conclusions may be drawn:

(*i*) Addition of sulphur dioxide results in browning than addition of benzoate or pasteurisation which ports earlier observations.

(*ii*) Addition of citric acid, lime juice, ascorbic acid increases browning.

(*iii*) In most of the trials where the brow effect is more in Sathgudi orange than in Coorg orange juice that may due to higher percentage of sugars the former[9].

(*iv*) In fruit squashes preserved with SO_2 sodium benzoate the extent of brow is the least in musk melon and high in amla, jack fruit and papaya coming between.

(*v*) There is less browning in segme canned after lyepeeling. This may due to removal of cell wall substan including pectic materials and bit principles. Since there is no result change in pH, neutralisation of a does not seem to play any part in this.

Further work regarding the mechanism a rate of browning in these and other fruit produc is in progress.

Acknowledgment

Grateful acknowledgment is made to Dr D. Bhatia, Dr Girdhari Lal and Dr V. Subrahma yan for their keen interest in the investigation.

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THE EFFECT OF REPLACING RICE IN THE DIET BY TAPIOCA-MACARONI ON THE METABOLISM OF NITROGEN, CALCIUM AND PHOSPHORUS IN CHILDREN

In a previous publication from this laboratory was reported that undernourished children bsisting on an inadequate and ill-balanced e diet grew at a subnormal rate but showed a markable adaptation to low levels of intake main-ining on an average slightly positive nitrogen, lcium and phosphorus balances[1]. In a recent iblication Subrahmanyan *et al*[2] reported that placement of rice in the diet of such under-urished children by tapioca-macaroni (com-sed of tapioca flour 60 parts, low fat groundnut ur 15 parts and semolina 25 parts) for a period six months did not cause any deterioration the general health, nutritional status and growth children. The present note deals with udies on the metabolism of nitrogen, calcium d phosphorus in children fed on diets based on e and tapioca-macaroni respectively.

The present investigation was carried out when e institution feeding experiment with tapioca-acaroni had progressed for a period of 3 months.[2] ive pairs of children aged 9-11 years were select- from among the subjects of the feeding experiment for the metabolic study. The girls in each pair were comparable in age, weight, height and nutritional status. One group (Control) received the usual orphanage diet which on a daily average basis had the following composition: rice 225.0 g; bread 16.8 g; pulses (Bengal gram and horse gram) 25.8 g; vegetables (Amaranth, Radish, green tomato and potato) 44.5 g; skim milk powder 10.0 g; American butter oil 2.8 g; jaggery 18.2 g; salt 6.3 g; spices and condiments 6.2 g. The second (experimental) group received the same diet in which rice was replaced completely by tapioca-macaroni. The composition of tapioca-macaroni was the same as that reported earlier.[2]

The diet, urine and faeces of children in the two groups were collected daily during a 5 day experimental period. The diet and the excreta were preserved and analysed for calcium, phosphorus and nitrogen according to the methods described by Murthy *et al*[1]. The results obtained for the metabolism of nitrogen, calcium and phosphorus are given in Table I.

TABLE I. *Mean daily intake, excretion and balance of nitrogen, calcium and phosphorus of children on the rice diet and tapioca-macaroni diet*

DIET	INTAKE	EXCRETION			BALANCE
		Urinary	Faecal	Total	
			Nitrogen (g)		
ice (Control*) ...	4.528	2.599	1.143	3.742	0.786
apioca-macaroni (Experimental) † ...	6 240	3.834	1.465	5.299	0.941
ifference (Experimental—Control) ...	1.712	1.235	0.322	1.557	0.155 ±0.170 ‡
			Calcium (mg)		
ice (Control†) ...	285.2	65.9	190.8	256.7	28.5
apioca-macaroni (Experimental)† ...	380.1	50.3	236.5	286.8	93.3
ifference (Experimental—Control) ...	94.9	15.6	45.7	30.1	64.8 ± 18.5‡
			Phosphorus (mg)		
ice (Control) § ...	546.8	192.3	271.1	463.4	83.4
apioca-macaroni (Experimental) † ...	562.4	181.0	274.7	455.7	106.6§
ifference (Experimental—Control) ...	15.6	—11.3	3.6	7.7	23.2 ± 10.6‡

* Calorie intake 1121 cal./child/day
† Calorie intake 1130 cal./child/day
‡ Value with its standard error
§ Rounding of error

The results showed that replacement of rice in the diet by tapioca-macaroni caused an appreciable increase in the retention of nitrogen, calcium and phosphorus.

The differences (experimental minus control) in the retention of nitrogen, calcium and phosphorus between the two groups, on statistical analysis, were, however not found to significant.

Our thanks are due to Mr A. N. Sank for the statistical analysis of the results.

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EFFECT OF MILLING ON THE NUTRITIVE VALUE OF JOWAR (*Sorghum vulgare*)

Jowar (*Sorghum vulgare*) is one of the important millets cultivated in different parts of India. It is also grown to a considerable extent in other countries especially in Africa, China, U.S.A., and South America[1]. Usually the grain is powdered and the whole flour is made into unleavened bread. Rice eaters generally consider jowar somewhat difficult to digest. This may be due to the presence of pentosans and fibre in greater amounts in jowar as compared with rice. It is possible that jowar flour prepared from 'polished' jowar will be more readily digestible than whole jowar as reported by other workers in the case of wheat and rice[2,3]. The present investigation was undertaken to study the nutritive value and digestibility of polished jowar as compared with whole jowar.

A sample of jowar obtained from the local market was polished in the rice huller (Engelberg model) to the extent of 35-40 per cent. The different samples of polished and unpolished jowar were analysed for their protein, calcium and phosphorus by the methods of A.O.A.C[4]. and thiamine by the method of Swaminathan[5]. The results given in Table I show that milling of jowar results in a considerable loss of proteins and minerals.

TABLE I. *Chemical composition of polished and unpolished jowar*

Jowar sample	Protein %	Thiamine (μg/g)	Crude fibre %	Calcium mg. %	Phosphorus mg
Polished jowar ...	7.8	2.1	0.4	20.8	124
Unpolished jowar ...	9.5	3.5	2.1	39.2	275

The nutritive value of poor vegetarian diets containing polished and unpolished jowar was studied by the rat growth method. The composition of the diets was the same as that described by Murthy *et al*[6]. Two series of experiments were carried out. In the first series two groups of 8 rats each were fed *ad lib* on the diets while in the second series, two groups of animals were paired fed. The methods of preparation of experimental diets and feeding of animals were the same as those described by Murthy *et al*[6].

The results given in Table II show that unpolished jowar promoted a significantly highe

TABLE II. *Average weekly increase in body-weight of rats on poor vegetarian diets based on polished and unpolished jowar*
(Duration of experiment—8 weeks)

DIET	Ad. lib. feeding			Paired feeding		
	Average daily food intake (g)	Average weekly gain in weight (g)		Average daily food intake (g)	Average weekly gain in weight (g)	
Polished jowar ...	8.8	5.59	± 0.152 (6 d.f.)	8.6	5.50	± 0 (6 d
Unpolished jowar	9.2	8.23		8.6	8.02	

rowth than polished jowar. When the growth xperiments described above progressed for a eriod of 3 weeks, the rats were kept in metaboli-m cages and a study on the nitrogen, calcium nd phosphorus balances in the animals on the lifferent diets was made. The results are given n Table III.

The results presented in Table III show that he rats fed on unpolished jowar diet retained significantly larger amounts of nitrogen and phosphorus than those fed on polished jowar diet. The difference in the calcium balance was however not significant.

Our thanks are due to Mr A. N. Sankaran for the statistical analysis of the results.

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GOWRI SUR
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TABLE III. *Nitrogen, Calcium and Phosphorus metabolism* of rats fed on diets based on polished and unpolished jowar*

(Figures represent daily averages in mg.)

DIET	NITROGEN					CALCIUM					PHOSPHORUS				
	Intake	Excretion		Balance (mg)		Intake	Excretion		Balance (mg)		Intake	Excretion		Balance (mg)	
		Urinary	Faecal				Urinary	Faecal				Urinary	Faecal		
A. Polished jowar ...	155.2	80.4	39.2	35.7	+1.68 6 d.f.	6.53	0.69	2 48	3.36	+0.07 6 d.f.	16.87	2.61	7.06	7.20	+0.44 6 d.f.
B. Unpolished jowar ...	180.0	80.8	53.7	45.6		9.26	0.86	4.85	3.55		31.57	9.18	12.50	9.89	

* The differences in the nitrogen and phosphorus balances only between A and B are significant at 1% level.

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Chewer's favourite

ASOKA **SCENTED BETELNUT POWDER**

Manufacturers: **M. K. Krishna Chetty, Post Box No. 106, Coimbatore**

Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during June-July, 1958 are given in this section.

S (IS) 19

Roller dried infant food—a pilot plant study, by M. R. Chandrashekhara (*June* 28, 1958).—The speaker dealing with the relative advantages and disadvantages of a spray drier and roller drier for drying milk said that the main drawback in the use of a spray drier is that it can be used economically only in areas where milk should be available to the tune of 40 to 50 thousand pounds per working day of ten hours, and there are very few areas in India having sufficient milk to feed spray driers. A spray drier with all accessories costs about 17 lakhs of rupees and in addition requires an expensive building and expert supervisory staff for working it. Roller driers can be economically worked even in areas where the milk supply is of the order of even 5000 to 10,000 lb. per day. Roller dried milk powder has a slight cooked taste which is usually liked by the people. Unlike spray dried milk powder, roller dried milk powder does not require nitrogen packing. The only disadvantage with roller dried powder is that it is only soluble in water to the extent of about 82 per cent at 25° C and 92 per cent at 60°C as compared to 100 per cent solubility of spray dried milk powder. But in view of the fact that infant foods are generally reconstituted in hot water (70°-90° C) in India, the slightly lower solubility of roller dried powder cannot be considered as a serious drawback. In addition, the capital cost for setting up of a roller drier with all the accessories is much less than that required for a spray drier.

The speaker next described the large scale manufacture of roller dried infant food carried out at Varanasi. The process in brief was as follows: The milk was received in the factory after being pasteurized at the co-operative dairy, was skimmed to 2.5 per cent fat level and was poured into an enamelled cast iron trough provided with a revolving steam coil which heated the milk to about 60° C. Sugar in the ratio of one to three of milk solids was dissolved in boiling water and added. The buffer salts, sodium phosphate and citrate were dissolved in water and added to the milk. The heated milk was then homogenized after the addition of B-complex vitamins, vitamin C and vitamins A and D. The homogenized milk was heated to 60°C and fed to the roller drier. The roller drier consisted of two rollers, 5 feet long and 2 feet in diameter revolving at 16 r.p.m. The rollers were internally heated by steam at 50 pounds pressure per sq. inch. With uniform feeding the drying of milk was very satisfactory. The dried milk came off the rollers as a wfaer thin sheet which was collected in trays, powdered and packed.

The roller dried infant food contained about 23 per cent protein and 16 per cent fat and was almost similar in composition to that of spray dried infant food prepared earlier by the speaker and his colleagues. The storage studies with the roller dried powder packed in air are still in progress. But from the results obtained so far, it can be safely said that the shelf life of the product at room temperature (24°-30° C) will be more than twelve months. The addition of iron at 3 mg. per cent level did not affect either the taste or the keeping quality of the product. The iron content of the powder was quite high (12.5 mg. per cent) and this might have been derived from the rollers which were made of cast iron. The copper content of the powder was very low (3.3 p.p.m.). It was observed that vitamin C was lost to the extent of about 50 per cent during the drying process.

Feeding trials with 17 infants for a period of three and half months were carried out with the roller dried infant food. The infants were first clinically examined and their height and weight were measured at fortnightly intervals. The average growth of the infants was 0.88 lb. per month, which was almost the same as that obtained with spray dried food last year.

The speaker then gave the details of the costing of roller dried and spray dried infant food, taking into consideration the cost of equipment, building, raw materials, utilities, maintenance, packing and other overheads like insurance, interest on capital etc. The ex-factory cost of either roller dried or spray dried infant food packed in tagger top tins with lever lid works out to about Rs 2 per lb.

The speaker then answering the questions raised during discussion said that he is not in a position to explain the loss of vitamin A and it is possible that high metallic content may be one of the causes. However, further work is necessary on this aspect. He added that no anti-oxidant had been added except vitamins C and E. It was suggested that comparative tests of this product should be carried out along with standard infant foods available in the market.

The President then reviewing the discussion said that we are interested that some manufacturer should take up the process and make it a success. We should impress upon the manufacturers about the strict observation of sanitary condions and usage of standardized quipments. We should try to eep the vitamin A of the product ntact and the iron content should e taken care of. There are convincing advantages of the product nd we hope this will ultimately ucceed in capturing the Indian narket.

(IS) 20

Detection of adulteration of hee with vanaspati, by O. P. Kapur (*July* 22, 1958).—The speaker outlining the history of vanaspati manufacture and public agitation gainst it, gave the various reports where vanaspati had been used as a main adulterant. The various steps taken by the Government from time o time were described. Regarding he colouring of vanaspati, so far, no uitable colour has been found which ould satisfy all the requirements aid down for it. The speaker hen referred to various methods of detecting adulteration of *ghee* with anaspati with special reference to urbidity temperature and Baudouin tests. It was felt that both f these tests are laboratory tests nd could not be adopted by an verage person. Experiments were onducted to simplify the Baudouin est, with a view to using only a few rops of *ghee* for the test, and to nake the chemicals available to the uyer, who could himself conduct he tests. Trials made to replace HCl were unsuccessful. It was ound that a mineral acid at high oncentration was essential for ydrolysing sesamolin in sesame oil o sesemol (the colour donor), and HCl (AR) as already found by Baudouin, was the best answer. ttempts made to provide HCl n a wax coated tablet form, was nsuccessful. Finally, sealing HCl n a glass capsule which could be nade to break, when required, was hought of as a solution and it was ound promising. The use of cane ugar was not pursued because the olour obtained, could be misleadng. Various other sources of urfural were tried but no success ould be achieved. Then to stabilize furfural, various chemicals like EDTA, bisulphites, ascorbic acid, were tried, but negative results were achieved during storage. Finally, a 2 per cent alcoholic solution of furfural sealed in coloured glass capillaries have so far kept well for a period of over three months.

The speaker then referred to the suggestion of the Director for making this test at micro-level and described a semi-micro-method, which would involve the use of ten drops of HCl, 2-3 drops of 2 per cent alcoholic solution of furfural and 10 drops of melted and clear fat sample under test. He then demonstrated the method which could easily be adopted by an average buyer where detection of even 5 per cent level of adulteration could be made. He said that so far hundreds of the sample tubes for the test have been sent to various public analysts and health officers.

During the discussion that followed, the Municipal Commissioner of Mysore along with his assistants gave an assurance of adopting this test for detecting adulteration. While answering the questions, the speaker pointed out that the recurring cost of each test would be only two *naye paise*. To increase the sensitivity of the test further, the use of raw or alkali refined instead of alkali refined, bleached and deodourised sesame oil, is being investigated. Other points raised were the effect of rancidity, heated oils, and mixing of vanaspati with milk before making butter.

Concluding, the President remarked that the adulteration will not be only 5-10 per cent in Bazar samples and therefore we should try to develop a method where only a drop or two could be used for detecting the adulteration preferably with cold *ghee*. He stressed that the possibility of processing coconut fibre to extract a furfural base which could be used in place of the furfural solution, should be explored.

S (IS) 21

Arecanut (*Areca catechu* **Linn**), by T. N. Ramchandra Rao (*July* 26, 1958).—Introducing the subject, the speaker briefly outlined the area of distribution of arecanut, in India, Ceylon, Malaya and Indonesia. There are twenty species in the genera palmae, out of which four species of areca are found in India. The betelnut of commerce is derived from *Areca catechu*. Both in the methods of cultivation and yield, we have two distinct types, namely those prevailing in Kerala and Mysore and those in West Bengal and Assam. Like any other plant, *Areca* is also subject to the infection of fungi, which cause a great deal of damage.

In India, we have a total acerage of 2.5 lakh acres under this crop and produce about 21.45 lakh maunds of the nut annually. In spite of this production, we import nuts valued at rupees four crores, annually, to meet the internal demand. With a view to meet this gap in production, it is planned to produce at the end of the second plan about 27.22 lakh maunds of the nut annually in India. The Planning Commission has set aparta sum of rupees forty lakhs for development and technological research.

The chemistry of the nut indicates that it is a good source of tannins and the alkaloid 'arecoline'. In south India, various processing methods are in vogue with a view to reduce the tannins which are the chief cause of astringency in the fresh nut. The fruit portion forms only about 35 per cent of the whole nut, leaving about 65 per cent in the outer husk. The annual tonnage of the husk is about 5,000 and it consists largely of cellulose fibres. The habit of chewing betel covers about half the human race and ancient Hindu medicinal dictionary ascribes aphrodisic and digestive properties to a good 'chew'. A touch of romance has always surrounded this time-honoured custom.

The discussion centred round the different methods of processing, with a view to retain the flavour of the nut and the aromatic adjuvants added. The pharmacological aspects of the 'alkaloid' and its role in metabolism need to be studied in detail.

The President, in his concluding remarks, drew attention to the fact that very little work had so far been done on developing the technological aspects of the problem. Chewing the betel with *pan* was an established custom and we have to unravel its role in metabolism. It should be our aim to process the nut with a view to not only retain its flavour but also to remove the red stain if possible. Dealing with the pharmacological aspects, he said the abnormal effects as noticed in some young nuts remain to be investigated. The role of 'chew' in digestion deserves greater attention and detailed study.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Savoury cakes (Matthies)

E (IS) 68

Kindly let us know the recipe and the method of preparation of savoury cakes.

The following is the recipe and method of preparation of savoury cakes:

Plain flour (not wholemeal)	3 teacupfuls (12 oz.)
Butter-fat (set)	2½ tablespoonfuls (4 oz.)
Caraway seeds (optional)	1 dessertspoonful.
Salt	1½ to 2 teaspoonfuls.
Milk-curd or milk	2 tablespoonfuls
Hot water	2 tablespoonfuls (about)
Liquid fat or frying oil	1 pint.

Sieve the flour into a mixing bowl; heat the butter-fat to nearly smoking point and pour onto the flour. Add salt and caraway seeds, and mix it well with your hands, gradually adding the hot water and curd. The pastry for matthies should be quite stiff, and well worked. Take a small piece of pastry, and after making a ball of it, roll it out into the shape of a large, round biscuit (not too thin). Due to the stiffness of the pastry, the edges will be uneven.

Put the oil or fat in a deep drying pan, and bring it to nearly smoking point. Fry the matthies quite slowly, putting three or four in the pan at a time, turning with a slice whenever necessary. They should not be allowed to get really brown.

Small triangular-shaped or cube-shaped cakes can also be made. For the former, after shaping the piece of pastry into a ball, roll out into a small thin pancake, but in half, and then fold twice into a triangular shape.

For a cube shape, roll a lump of pastry out in the same way as for biscuits, and cut into the desired shape.

Matthies are usually served cold, and are a great tea-time favourites. In an airtight tin, they will keep for nearly a fortnight.

Composition of cream caramels

E (IS) 69

We shall appreciate if you kindly tell us the composition of cream caramels.

Dairy solids are the main ingredient of good cream caramels. Fluid whole milk or sweet cream gives a good rich flavour. In making caramels one of the important functions of butter fat is to impart milk flavour. The flavour of the caramel is probably improved more by the inclusion of butter fat than by the use of any other single ingredient. Butter fat is also important in providing better emulsification because of the phospholipids contained therein, particularly lecithin.

Milk protein in caramels is important for the proper development of body, texture and flavour. Casein protein has excellent water absorbing properties and provides much of the structural characteristics attributed to milk solids. The non-casein protein, which is largely of the albumen type, is important for smoothness of body and texture.

Lactose or milk sugar is the major constituent in milk products for the production of an attractive golden-brown colour and caramelization. It is only one-sixth as sweet as cane sugar and therefore is widely used to reduce excessive sweetness in caramels.

In making caramels the cooking process is very important. The batch is first started on low heat until all the sugar is dissolved. The heat may then be increased moderately until the batch begins to thicken. Then the heat is again decreased to prevent the batch from scorching. The caramels should always be finished at low heat.

The cooking is usually done by the steam cooking method; a good large high-pressure steam kettle with stirring paddles is used to produce good results.

When making caramels for chocolate coating it is important that the chocolate be selected with great care; a good mellow milk chocolate and a good dark vanilla sweet chocolate blended very well with caramel centres add greatly to the character of the finished product.

Composition of tapioca macaroni and rice

E (IS) 70

We are interested in knowing the comparative nutritive value of tapioca macaroni and rice, so we shall appreciate if you could let us have this information.

Tapioca macaroni products have been prepared from a blend of tapioca flour (60 parts), groundnut flour (15 parts) and wheat flour (25 parts). The nutritive value of the tapioca macaroni rice and other products prepared from the blend as compared with that of rice is given in the accompanying table.

	Rice %	Tapioca macaroni products %
Moisture ...	12.5	10.6
Protein ($N \times 6.25$)	6.6	10.5
Fat ...	0.5	1.9
Ash ...	0.6	1.8
Fibre ...	0.2	0.7
Carbohydrates (by diff.) ...	79.6	73.8
Calcium (Ca) ...	0.01	0.05
Phosphorus (P)	0.02	0.14
Iron (Fe) mg. ...	1.8	2.9
Thiamine (mg.)	0.11	0.22
Nicotinic acid (mg.)	1.2	3.7
Riboflavin (mg.)	0.02	0.07

The data show that tapioca macaroni products are richer than natural rice in protein, calcium and B-vitamins. Feeding experiments on experimental animals have shown that the growth promoting value of a poor vegetarian diet based on tapioca macaroni rice was about twice that obtained with rice diet.

Method of cooking macaroni

E (IS) 71

We have noted with interest the manufacture of tapioca macaroni at your Institute. Kindly write to us how it is cooked.

About 8 volumes of water are brought to boil and when the boiling is steady, one part of the macaroni product is gradually added to the water, with gentle stirring. The cooking takes about 10 minutes but that can be easily determined by taking out samples and feeling with the hand. The product should swell and absorb about three times its volume of water. When it is felt that the cooking is complete, the gruel may be drained away. The cooked grain is ready for use. The gruel can be suitably spiced and used as a soup.

Composition of Indian Multipurpose Food

E (IS) 72

Could you kindly let us know the composition of the Indian Multipurpose Food developed by you?

The composition of the multipurpose food developed by us is as follows:

Constituents	*Per Ounce*	*Per cent*
Protein (g) ...	12.0	41.9
Fat (g) ...	2.4	8.5
Carbohydrate (g)	10.2	35.8
Calcium (mg) ...	190	665
Phosphorus (mg)	234	820
Iron (mg) ...	1.5	5.1
Vitamin A (I.U.)	857	3000
Vitamin B (Thiamine) (mg.) ...	0.4	1.3
Vitamin B_2 (Riboflavin) (mg) ...	1.0	3.0
Nicotinic acid (mg)	4.0	14.0
Vitamin D (I.U.)	71	300
Calories ...	111	387

E (IS) 73

I am interested in the preparation of guava jelly on a home scale and shall be glad if you could kindly let me know the method of preparation of the same.

For the preparation of guava jelly select sound, firm and rather tart fruits free from blemishes. Soft fruit does not possess the setting property and hence should be avoided as far as possible. Wash the fruit thoroughly under running cold water scrubbing with hands where necessary. Cut the washed fruit with stainless steel knives (the ordinary knives stain the fruit black and thus make the product unattractive) into small pieces and cover it with water adding citric acid at the rate of 10-15 grains per pound of the fruit.

Boil the mass for about half an hour with occasional crushing with a wooden ladle till the extract shows good stickiness. Put the mass in a coarse cloth and separate the extract. Add to the pomace one fourth its weight of water and take another extraction. Get a similar extraction once again. Strain the extracts and then keep the mixed extracts over-night for settling in a deep container.

Decant the clear extract carefully. To a teaspoonful of this clear extract add two teaspoonfuls of methylated spirit. The formation of one big clot indicates that the extract is rich in pectin, whereas slightly smaller clots indicate that the pectin content of the extract is medium and the formation of a thin gelatinous mass with very small clots shows that the extract is poor in pectin.

To every cup of the clear extract add $\frac{3}{4}$ to $\frac{1}{2}$ cup of sugar respectively according as the extract contains rich or medium pectin. In case the extract is poor in pectin, concentrate the same till it gives a good pectin test and then add the requisite quantity of sugar.

Cook the mixture till the mass boils at 222°F at sea level or till it gives a sheeting test i.e., if it is held in the spoon it starts dropping in the form of flakes and not in drops. (*Note:* For every 500 ft. rise in altitude the boiling point of water falls by 1°F and a corresponding decrease may be effected in cooking temperature).

Pour the finished product into clean dried sterilized glass jars keeping a wooden board below.

(*This prevents breaking of glass containers when hot product is poured into them*). Let the product cool and then seal air-tight.

Preparation of lime and lemon squash

E (IS) 74

We have thought of starting a small fruit products preparation factory. We are particularly interested in the preparation and preservation of lime and lemon squash, so please advise us on the subject.

Select fresh, fully ripe fruit free from bruises and particularly from fungal attacks. The bigger size fruit of the lemon species should be graded according to size. Wash the fruit thoroughly under a spray of cold water, preferably in small lots at a time, to remove dirt, spray material and other extraneous matter. Cut the fruit into halves with sharp stainless steel cutting knives. Extract the juice with lime-squeezers or in a small basket press in the case of limes or with a cone type juice extractor (Mix Master)* in the case of lemons. Strain the juice through a coarse muslin cloth to remove seeds and coarse pulp.

The following recipes have been worked out on the basis of our experimentalwork:

	Medium sugar squash	*High sugar squash*
Juice	4 lb.	1 lb.
Sugar	5 lb.	2 lb.
Water	3 lb.	3 oz.

[*Note:* (*i*) A suitable quantity of edible yellow colour is added to bring out the desired shade of colour in the finished product.

(*ii*) For recipe with high sugar content the ingredients may be mixed by slight warming, if necessary.]

Mix the above quantities of the ingredients thoroughly and strain through a coarse muslin cloth. Finally add the preservative i.e., potassium metabisulphite at the rate of 5.0 grains per lb. (or $\frac{1}{4}$ '*masha*' per bottle of 26 oz. capacity) of the finished product.

(*Note:* The preservative which can be had from any chemical supplier or any branch of the Imperial Chemical Industries should be dissolved in a small quantity of water or the finished product and then mixed with the rest of it to ensure uniform mixing).

Pour the finished product into bottles which had been thoroughly cleaned and previously heated in boiling water for 15-20 minutes leaving a head space of 1-1½ inches. Cork air-tight either with crown cork seal or with ordinary cork (slightly wetted and pushed in). Store the bottles in a cool, dry place.

Canning of pineapple

E (IS) 75

Please let us know the method of canning pineapple and the different steps involved in the same.

Pineapple is a tropical fruit and is cultivated in India chiefly on the West Coast, Assam and West Bengal. On account of its pronounced flavour, the fruit lends itself to the preparation of a good canned product, the method of which is described below:

Selection of fruit: Select ripe fruit which has developed a characteristic reddish brown colour on its peel.

Preparation of the fruit: Remove the head of the fruit which is spread out into a number of spines by a sharp twist with hand. Cut the fruit transversely into ½" thick slices using a big sharp stainless steel knife. Remove the fibrous coating with a speci designed borer type sharp di and the central hard core with similar type small size borer. Tr off the eyes, if any, left in the disc with a V-shaped stainless knife, thus getting rings of uniform size.

Filling and syruping: Place t prepared pineapple rings (5-6) in butter size plain can and fill t interspace with boiling sugar syrup, prepared by mixing one cup o sugar with one cup of water, leaving about ½" headspace.

Exhausting and sealing: Place the filled cans with lids loosely on, in a large pan containing boiling water in such a way that the water level outside is about 2 below the tops of the cans. Cover the pan and heat for about 10 minutes (when the centre of the can records a temperature of 160°-170° F). Seal the cans with a can sealer.

Pasteurization and cooling: Put the sealed cans in boiling water kettle with its bottom covered with a thick cloth or by a wooden frame, and continue boiling for about 15 minutes. Remove the cans quickly and leave them in running cold water.

Storage: Take out the cans while still warm and leave in the open air after wiping them dry. This facilitates quick drying of the wet surface of the cans, thereby avoiding rusting. Store in a cool, dry place.

Use: The canned fruit along with the syrup may be used as a sweet dish either alone or with cream and fruit salad.

Drying of ginger

E (IS) 76

We have large quantities of fresh ginger and we are interested to dry it into a clean product. Please give us full details on its drying.

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* This type of equipment can be had from food machinery dealers like Messrs Gardners Corporation, Conna Circus, New Delhi, and Gladwyn & Co., Hornby Road, Bombay.

Ginger is removed from the field when quite mature (when the thickness of the root-lets ranges from ½″ to ¾″). It is thoroughly cleaned by rubbing in running cold water, after which it is left in bamboo baskets to drain off the water. The outer layer of the fresh clean ginger is scraped with a sharp stainless steel knife, as the upper ine. layer constitutes the inedible part. (This step may sometimes be omitted when dealing with large quantities on a commercial scale). Thoroughly cleaned ginger free of all dust and extraneous matter is spread on ordinary trays 6′×3′ having a wooden framework and wire-gauge bottom and left in the sun, care being taken to keep off dust, insects, etc. This method of sun-drying can be tried with success at places where the weather is dry and hot. It will take 8-10 days for drying. However, when the weather is uncertain or rather wet, artificial drying in the Home Drier proves more successful.

MPF (Indian and American)

E (*IS*) 77

How do you compare the chemical composition of Indian Multi-Purpose Food with that of the American Multi-Purpose Food?

Constituent	Indian M.P.F.	American M.P.F.
	per cent	per cent
Moisture (g) ...	6.3	6.7
Protein (N×6.25) (g) ...	41.9	44.3
Fat (g) ...	8.5	7.6
Ash (g) ...	7.0	6.5
Carbohydrate (by diff.) (g) ...	35.8	36.9
Calcium (g) ...	0.665	0.587
Phosphorus (g) ...	0.820	0.440
Iron (mg) ...	5.1	7.0
Thiamine (mg) ...	1.3	0.7
Nicotinic acid (mg)	14.0	7.0
Riboflavin (mg) ...	3.0	1.2
Vitamin A (I.U.)	3009	2940
,, D (I.U.)	300	235
Calorific value ...	387	386

Notes and News

Monthly production statistics of food products for March 1958

Name of the Industry	Units	No. of units reported	Production during March 1958
1. Biscuit ...	Tons	30	1,260
2. Confectionery ...	,,	31	720
3. Flour Milling ...	,,	43	52,500
4. Butter ...	,,	5	139
5. Cashewnut ...	,,	10	1,625
6. Gram Flour and *Dal* ...	,,	1	358
7. Aerated Water ..	Gross bottle	31	58,500
8. Beer ...	Bulk gallons	2	1,30,165
9. Indian-made foreign liquors	,,	16	55,118
10. Country spirit ...	L.P. gallons	27	5,59,236

(*Ministry of Commerce and Industry, Government of India, New Delhi*)

NEWS BRIEFS

New insecticide: Phosdrin insecticide, a new systemic organophosphate manufactured by Shell Chemical Corp., recently received U.S. Department of Agriculture label acceptance for use against aphids, leafhoppers and grasshoppers attacking soyabeans.

This new product has the unique feature of quickly killing insects, then rapidly breaking down within the plant into harmless compounds. Because of its short residual life, this new insecticide can be used throughout the season up to one day before harvest.

Like most phosphate insecticides, Phosdrin insecticide is highly toxic to man, but the hazards are minimized when it is handled according to label directions and precautions (*Soybean Digest*, January 1958, p. 27).

Improved flash desolventizing of hexane-extracted soybean flakes: The flash desolventizing principle for removal and recovery of hexane from soybean flakes with minimum protein denaturation has been studied in a 150-pound-per-hour pilot plant. In this unit the flakes are rapidly heated to 160-200° F, in a high velocity stream of superheated hexane and water vapours which conveys them to a cyclone separator where they are picked up by a cold air stream and cooled rapidly while being conveyed to storage.

By holding heat treatment of the flakes to only about 5 seconds, heat damage to the protein, as measured by the Nitrogen Solubility Index (NSI), is minimized. Soybean protein flakes with an NSI of 87 per cent to 90 per cent were produced from a wet feed with an initial NSI of 91 per cent to 92 per cent while the hexane content was reduced from 30 per cent to 35 per cent to approximately 0.5 per cent (*Soybean Digest*, April 1958, p. 15).

Invents machine for sprouting soybeans: Soy or Mung beans served in Chinese foods have traditionally been sprouted by individuals. By hand, the process requires 3 days and constant attention.

Benny Narn Chew of Philadelphia has invented a machine that minds the beans and more than doubles production. He received Patent No. 2,814,912 for his invention, which adds water to the beans at regular intervals, increasing the amount of water as needed each day. It also controls water temperature. Good quality sprouts are produced with a minimum of root and large, plump hypocotyls (*Soybean Digest*, April 1958, p. 33).

New polyethylene resin: A new polyethylene resin has been introduced by Eastman Chemical Products, Inc., and is expected to add still another dimension to the use of this fastest growing family of plastic materials. Identified as Epolene 'C', the new type polyethylene possesses many of the properties generally associated with plastic grade resins and yet can be handled much like a moderate to high melting point wax.

Because of its wax-like characteristics, Epolene 'C' can be handled as a melt, with or without modification. At 300° F., for instance, the viscosity of the new resin is 8,000 cps. The addition of 25 per cent paraffin, with which it is completely compatible, reduces the viscosity to only 1,300 cps., at this temperature.

As a hot dip, its application as a pro-attached should be discarded. Other substances can be assumed to be innocent but tests to prove this innocence are not worth while (*British Packer*, April 1958, p. 208).

'Panostic'—a new packaging material: Panostic, a new packaging and display material consisting of a layer of polymethane foam with a pressure sensitive adhesive on both sides, is arousing wide interest. The adhesive surfaces are protected until required for use by a Genotherm film which is peeled off.

It is ideal for packing any delicate instruments, glass and fragiles, or for goods which have to be fixed to their containers.

For displays, particularly point-of-sale, Panostic can be used to mount light articles of any shape direct to glass, metal or plastics surfaces or attaching showcards to refrigerators, washing machines, etc. At present Panostic is manufactured in 1 in. and 2 in. wide strips. (*British Packer*, April 1958, p. 229).

Thickener for frozen and canned food: An improved thickener, said to have exceptional stability, neutral taste, and excellent clarity, is being marketed to food processors by National Starch.

Called Col-Flo 67, the corn starch material is especially suitable for canned and frozen gravies or other foods having a gravy base, prepared pie fillings, and tomato-based sauces the company says. But it can be utilized in other food products that need a thickening agent.

Col-Flo 67 is an improved and modified version of National's standard Col-Flo. Manufactured by a process which permits close control of properties, it does not retrograde and is heavy in body. Virtually tasteless, Col-Flo 67 does not alter or influence the taste of a food product into which it is incorporated, the company reports.

According to National, Col-Flo 67 is three times more stable than any starch now available to food processors. It is unaffected by freeze-thaw (*J. agric. Fd. Chem.*, April 1958, p. 314).

Canned fruit pie fillings: The use of L.M. pectin as a thickening agent has improved the quality of apricot, peach, and prune pie filling, and increased the stability of sour cherry filling stored at temperatures below 40°F. The amount used is approximately ⅓ of the starch portion of the stabiliser required to set the filling. The resulting gel is soft, bright, and does not impart a thickener taste to the product. Sour cherry fillings after 22 weeks' storage at 32 F. have shown no thickener coagulation. Those employing the starch formula showed co able coagulation within 10 wee (*Food Technol. Austr.*, June 195 p. 331).

Better coloured onion flak from warm-stored bulbs: O bulbs should be stored at aro 86°F. if dried flakes of best q are to be obtained. Although the look worse than bulbs stored temperatures near freezing, qu of dried flakes is considerably bett

Right after drying, there is li difference in appearance. But af storage at room temperature for months, flakes from bulbs held months at 86°F. were lighter in colour. Also, onions kept bett at this temperature so there was higher yield of sound bulbs (*F Engng.*, April 1958, p. 129).

Liquid-culture mushrooms good sources of protein: Whe grown in submerged aerated cultures, mushrooms are similar in nutritive properties to the Torula yeasts. However, they possess enzyme systems that are extensive and different from those of yeasts.

For this reason they can utilize lignins, cellulose, hemicelluloses, pectins and other polymers, and thus will grow on cheap substrates.

A study of 10 strains of mushrooms, including 4 Agaricus campestrics, grown on a synthetic medium, and on media containing molasses and waste sulfite liquor, showed that three strains produced good yields of protein with an efficiency of about 15 per cent on a protein to original sugar basis.

Boletus indecisus produced high yields of dry matter low in protein (25 per cent) while *Morchella hybrida* and *Tricholoma nudum* produced a lower yield of mycelium containing about 37 per cent protein.

Study of nutritive requirements of the last type showed that it yielded well when ammonium salts were a source of nitrogen, but that its growth was depressed by nitrates and urea.

A wide variety of carbon compounds could be utilized. Bo olasses and waste sulfite liquor ere good media. The pH optimum is 3.5-4.5 and neither aeration f the medium nor its phosphate oncentration had much effect on ycelial yield or composition (*Food ngng.*, April 1958, p. 129).

Falling film evaporator: A ew Swiss evaporator that employs e falling film principle, differs rom conventional type units in mployment of a rotor with radial lades to spread product onto walls f a heated cylinder.

Evaporator consists of a vertical cketed tube inside of which is a haft driven by an overhead motor, nd having several radial blades imensioned so as to leave only small nnular clearance. Blades extend early full length of shaft.

In operation, product enters pper part of tube where it is ngaged by rotating blades and hrown against wall of tube. This esults in: (1) formation of a thin ilm on tube wall, thus insuring rapid eat transfer, and (2) production of ufficient turbulence to avoid local verheating.

As film falls down heated wall, its lensity increases as the moisture vaporates. Concentrated product s discharged from the bottom. Vapours rise and leave cylinder at op. Upper portion of tube is not acketed and acts as a separator (*Food Engng.*, April 1958, p. 133).

NEW INDIAN STANDARDS

Animal glue: The Indian Standard Specification for Animal Glue (IS: 852-1957) covers three grades of the material. Methods for determination of jelly strength, viscosity, water absorption, keeping quality, moisture content, sulphur dioxide, chlorides, melting point and ash have been specified. Requirements regarding odour and sampling of sheet and cake glue have also been included.

This specification is one of a series of Indian Standards on adhesives which form one of the most important raw materials for plywood, wood-work and joinery industries (*ISI Bull.*, May 1958, p. 141).

Vetiver (*Khus*) oil: Requirements of *khus* oil and methods of test of various characteristics, such as ketone content, saponification value, total alcohols, optical rotation, refractive index, etc., have been prescribed in the Indian Standard Specification for Vetiver (*khus*) oil (IS: 1177-1957). The oil is distilled from wild *khus* roots found in the forests of Rajasthan, Uttar Pradesh and other States of Northern India. The standard does not cover the material either imported from foreign countries or obtained from *khus* roots now being cultivated mostly in South India. The material is used in the soap and cosmetic industry and also as a flavouring agent (*ISI Bull.*, May 1958, p. 141).

DRAFT INDIAN STANDARDS

Containers for preserved fruit: The draft Indian Standard Specification for Glass Containers for Preserved Fruit Industry specifies requirements of quality, workmanship and shape of such containers in addition to those of sampling, packing and marking. A test for limit of alkalinity of glass containers is described in an appendix to the draft standard.

Glass containers of varying qualities, sizes and shapes are being used at present by the preserved fruits industry. Often controversial opinion had been expressed by the consumers and manufacturers about the performance of glass containers manufactured in the country. In view of the considerable expansion of this industry during recent years, it has become important to ensure a regular supply of suitable quality of glass containers. The Tariff Commission, while going into the question of continuance of protection to the preserved fruits industry, also resolved that the ISI should laydown, as early as possible, in consultation with the glass industry, the preserved fruits industry and the Central Glass and Ceramic Research Institute, standard specifications for not only the composition of the glass but also the sizes and shapes of glass containers used in the preserved fruits industry. It is expected that this standard when published will assure supply of suitable quality of glass containers for the preserved fruits industry (*ISI Bull.*, May 1958, p. 145).

PATENTS

Indian

(A few of the Patent Applications notified as accepted in Part III, Section 2 of the Gazette of India from 15th February to 22nd February are listed below):

57576. *New esters of 5-acyl-8-hydro-oxyquinolines and their use for the control of fungi:* By reacting salts of 5-acyl-8-hydroxyquinoline or the free hydroxy compounds with halogen formic acid esters.—Patented by J. R. Geigy, A. G.

57594. *Process for the production of new pyridazine derivatives and their use as fungicides:* By reacting tricholoro methane sulphenyl chloride with a hydroxy or mercapto pyridazine.—Patented by J. R. Geigy, A. G.

58119. *Process for the manufacture of carotenoids:* Dienol ethers of decapentaene or decatetraene are condensed with a C_{14}-acetal and the resulting C_{40}-hexaalkoxy compound is treated with acid to product C_{40}-6, 13-diketone which is reduced and subjected to dehydration to yield C_{40}-carotenoids.—Patented by F. Hoffmann-La Roche and Co., Aktiengesellschaft.

59046. *Recovery of tetracycline from an acidified fermentation mash:* By adjusting the calcium ion content and adding one or more quaternary ammonium compounds to the fermentation mash.—Patented by American Cyananid Company.

60029. *Improvements in process for diazotization of amines:* Conducting reaction in plurality of succeeding reaction stages arranged in cascade and or one or more cycling systems.—Patented by Farbwerke Hoechst Aktiengesellschaft vormals Meister Lucius and Bruning.

60250: *Pure tetracyline:* The pH of a solution of tetracycline containing material is adjusted to 1-5 oxalic or succinic acid is added, the salt is recovered and if desired converted to free base.—Patented by H. Ogawa and S. Inoue.

59697. *A new antibiotic product and method of manufacturing same:* An antibiotic is treated with leucine or N-acylated leucine.—Patented by Chemie Grunenthal G.m.b.H.

60373. *Method of producing ascorbic acid:* Leaves containing the acidare ground in a screwpress, pressed in a hammer grinder, the juice is subjected to extraction by a solvent system comprising two non-miscible phases, the extract is concentrated, treated with acetic acid, and finally ascorbic, and is recovered from the extract.—Patented by M. Comar.

60403. *Improvements in or relating to the manufacture of sugars:* Which includes a preliminary step of separating sugar as an aqueous extract and then precipitating the sugars thereform by adding an organic solvent thereto.—Patented by K. S. Rau.

61156. *An improved process for the recovery of oil, nickel and filter aids from the spent nickel catalysts from vanaspati factories:* Spent nickel catalyst is treated with a ethanol or ethanol mixed with an organic solvent.—Patented by Shri Ram Institute for Industrial Research.

Foreign

2,819,975. *Coating fresh cut meats with animal fat cuts shrinkage, protects colour, texture* (U.S. Jan. 14, 1958):—Protection of fresh cut meat against dehydration and darkening of colour in storage, is accomplished by a patented process of spraying the cut surface with molten fat droplets.

Operation is carried out at a temperature low enough to cause the droplets of fat to congeal or partly solidify as they travel toward the meat which has previously been chilled.

Fat droplets are deposited in random layers, piled higher at some points than at others. The result is a flexible coating that does not crack or flake off like a film produced by dipping. Fat used should be obtained from the same species of animal as the meat to be coated.

In coating beef, for example, beef tallow at 140-160° F should be used. And temperature of atmosphere in which it is coated should be 35-40° F.. Experimental tests showed that colour and general condition of coated rib beef was far superior to uncoated samples, and shrinkage of the uncoated samples was higher than that of coated ones (*Food Engng.*, April 1958, p. 129.)

2,818,342. *Orange-milk drink* (U.S., December 31, 1957): Production of an orange-concentrate that will make a non-curdling drink when mixed with sweet milk is the basis of a patented process. Crux of the method is retention of substantial portions of peel oil and pectin normally locked in the peel cells and albedo.

In manufacture of the concentrate, clean whole oranges are passed through a screw-type juicer having a relatively long barrel, with exit holes through which the juice flows. Pulp is forced through small holes in the end plate.

In the juicer, peel and pulp are comminuted by knifes. Oil and pectin are released and collected as the mass is pressed through the end plate. Coarse pulp is strained from the resulting fluid, and sugar is added to the extent of 25-30 per cent of the extract, or about 5 lb. per gallon.

Product is packaged and frozen. The orange drink is made by adding one part concentrate to 4 parts sweet milk (*Food Engng.* April 1958, p. 134).

2,816,839. *Preserving walnuts* by dehydrating to 2-3 per cent moisture, storing in moisture-impermeable container (*Food Engng.* April 1958, p. 187).

790,113. *Preserving:* Relates to a method of extending the period of freshness of natural vegetable market products such as fruit and vegetables by controlling the activity of the enzymes contained in the natural vegetable products. The product has, applied to the surface thereof, a non-cationic, i.e. anionic or non-ionic, surface active agent in colloidal dispersion in an edible oil with or without the addition of ethylene glycol or another innocuous glycol.—Patented by H. Goldhammer (*Food Trade Rev.*, April 1958, p. 55).

790,792. *Concentrated milk:* Relates to a process of preparing a concentrated milk comprising heat sterilising whole milk, evaporating the milk at sub-atmosphere pressure, homogenising the milk at a temperature conducive to homogenisation and filling it into sterile air-tight receptacles, the treatment from evaporation to filling being done under asceptic conditions: by carrying out the steps of evaporation, homogenisation and canning under asceptic conditions, the necessity of carrying out a further sterilising step after the milk has been concentrated and homogenised is avoided.—Patented by Continental Can Co. Inc. (*Food Trade Rev.*, April 1958, p. 55).

790,394. *Packaging biscuits:* A packing for biscuits and the like comprises a guide wrapping, a slider container fitting slidably in the wrapping and a covering envelope completely enclosing the container and wrapping, wherein the wall portions of the guide wrapping and of the slider container are held in position solely by the envelope without the use of clamps, staples, stuck-on tabs or the like.—Patented by Schweizerische Industrie Gesellschaft (*Food Trade Rev.*, April 1958, p. 55).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Moist heat denaturation of soyabean proteins, by Franek, F., *J. sci. industr. Res.*, 1958, **17B** (5), 75.—A mathematically supported hypothesis is presented for explaining the changes in soyabean protein induced by the action of moist heat. The changes are interpreted as consecutive reactions: native protein, denaturated protein, protein reacting with carbohydrates. The first reaction predominates at lower temperatures (up to about 100°C.), whereas the second reaction becomes more prominent at higher temperatures. The inactivation of trypsin inhibitors, soyin and urease, induced by the action of heat on finely ground soyabeans, has been found to be very rapid.

The effect of different fats on blood coagulation, by Ramanathan, M. K. and Gopalan, C., *Indian J. med. Res.*, 1958, **46** (3), 466.—The effects of different types of fat on blood coagulation of human volunteers has been studied.

Following an intake of 85 g. of butter fat, the mean clotting time and stypven time of 30 volunteers were significantly less than the fasting values. However, prothrombin time using rabbits' brain emulsion, circulation time and serum cholesterol were not influenced by the high intake of butter.

Hydrogenated vegetable fat and coconut oil did not influence stypven time.

Butter, hydrogenated vegetable fat and coconut oil could be placed in the descending order with regard to their effect on whole blood clotting time.

The significance of the results has been discussed.

Effect of some dietary factors on serum cholesterol, by Gopalan, C. and Ramanathan, K. S., *Indian J. med. Res.*, 1958, **46** (3), 473.—The effect of feeding large quantities of different types of fat on serum-cholesterol concentration was investigated in a group of human volunteers and monkeys.

It was found that while butter and hydrogenated vegetable fat caused a sustained increase of serum cholesterol concentration, sesame oil had no such effect.

Diets deficient in proteins and/or calories were also found to reduce serum cholesterol concentration.

The significance of the above observations has been discussed.

Influence of cooking on the nutritional value of foods, Part III. Vitamin A content of some cooked foods, by Pai, M. L., *Indian J. med. Res.*, 1958, **46** (3), 481.—Several food preparations made out of cereals, pulses and vegetables have been analysed before and after cooking for their vitamin A content by the colorimetric method by a modification of the Carr-Price, antimony trichloride reaction. The results on dry weight basis have been given in a table along with the loss of vitamin A due to cooking. The loss of vitamin A varied between 10.5 and 70.0 per cent in various culinary preparations studied. In baked products such as *chapati*, bread, *puri* and *bhakari* made out of wheat, *jowar* and *bajra* flours, the loss ranged between 10.5 and 37.6 per cent. In preparations of cauliflower and cabbage, the loss was 34.3 and 39.5 per cent respectively. Considerable loss of vitamin A was found to occur during mincing and washings of these vegetables. the case of dhals of *tuver* and *mu* cooking resulted in a loss of 57— per cent of vitamin A. Raw rice loses after washing and cooki 23.1 per cent of vitamin A. T extent of loss of vitamin A depen upon the methods of prepar and cooking of the various items foods.

K.L.R.

Regional variations and adequacy of Indian diets: Statistical evaluation of diet surveys by Taskar, A.D. and Shantha, C.S. *Indian J. med. Res.*, 1958, **46** (3), 485.—The dietary habits of poo people are greatly influenced by th climatic and soil conditions. The variations observed in the intak patterns are mostly due to the types of cereals and pulses consumed. The data available on the intake o rice, wheat, millets, other uncommon cereals and pulses from 75 diet surveys carried out in differen States of India have been statistically analysed in this paper. It is concluded that the differences in the diet-intake patterns in differen parts of the country can be explained on the basis of consumption o types of cereals and millets.

K.L.R.

Studies on the effect of germination on strepogenin contents of pulses, Mitra, P. an Banerjee, S., *Indian J. med. R* 1958, **46** (3), 492.—It was observ by earlier workers that int protein when fed to chickens, and rats produced rapid growth a compared to a mixture of synthe amino acids which constituted t same protein. This growth-pr moting value of the protein attributed to a factor called 'st genin' which was peptide in nat d was liberated by tryptic diges- on. Some pulses have been re- rted to contain more strepogenin an casein. The AA have studied e strepogenin activity of pulses fore and after germination. repogenin concentrates were pre- red from six varieties of common dian pulses and the activity was termined by microbiological assay ing *Lactobacillus casei* as the st organism and casein as standard reference. The results have en graphically represented. It is und that *Phaseolus mungo*, *Phaseo- s radiatus* and *Pisum sativum* ve more strepogenin activity than sein while *Lens esculenta*, *cajanus dicus* and *Cicer arietinum* show sser activity. The strepogenin tivity of all the pulses after rmination for 48 hours diminished nsiderably and the activity was ss than casein. This may be due the possible degradation of repogenin during germination into bstances which have less growth- romoting value.

K.L.R.

AIRY

Improved chemical method r the preparation of dephos- horized casein, by Sampath umar, K. S. V., *et al.*, *J. sci. dustr. Res.*, 1958, **17C** (7), 115.—n improved method for the pre- aration of alkali-dephosphorized sein is presented. The method kes advantage of the unique ability f barium hydroxide to dephos- horylate casein at low alkali ncentrations without rupturing e protein. The dephosphorylat- d product is readily digested by roteolytic enzymes and has the ame N-terminal amino acids as ose present in casein.

ISH

Preliminary investigations on he pit curing of fish in India, y Suryanarayana Rao, S. V., *et al.*, *ndian J. Fish.*, 1958, **5** (1), 160.—A tudy of the process of pit curing f fish which is practised mainly n the east coast of the Madras tate was undertaken to determine he optimum conditions for the ure, keeping quality of the cured products and to evaluate the different chemical tests for the detection of spoilage during storage. Mackerel was chosen for the investigation which also included observations on the more common method of wet salting. Pit curing improved the organoleptic properties by imparting a characteristic flavour and softness to the flesh. However their appearance was rather unfavourable and their keeping quality limited to a few weeks after the cure. Wet salted mackerel on the other hand were found to keep in a good condition up to 2 months.

The beneficial effect of maturation or ripening under semi-anaerobic conditions in pit curing was reflected in the release of large amounts of free amino acid nitrogen during the cure. However the levels of Total Volatile Basic Nitrogen which had also increased during the curing period reached more than 500 mg. per cent (moisture-salt-free basis) after two weeks of storage. The optimum period for the cure was found to be two days in the case of gutted mackerel salted in 1:5 ratio. A comparative study of the changes in T.V.B. nitrogen, Trimethylamine, Formol Nitrogen and Peroxide Value during storage revealed the usefulness of T.V.B. increase as a test for the assessment of quality.

FRUITS AND VEGETABLES

Studies on varietal suitability of fruits for preservation by canning: Part I—Mangoes: by Bose, A. N. and Das, D., *J. sci. industr. Res.*, 1958, **17A** (5), 203.—Studies on the canning of three important varieties of mangoes, viz., *Fazli*, *Langra* and *Himsagar*, available in West Bengal have shown that *Himsagar* is best suited for canning. An acceptable product, which can be stored for 6 months without deterioration, is obtained by canning the fruit in 50 per cent sugar syrup. *Langra* also gives a satisfactory product when it is canned in 35 per cent sugar syrup containing 0.25 per cent citric acid but the flavour of the canned product deteriorates after 5 months. *Fazli* is least suited for canning as the flavour of the canned product deteriorates rapidly in whatever manner it is preserved.

MICROBIOLOGY

Search for new fungicides: Part I—Preparation of Halo-and Nitroderivatives of 1:4-Naphthoquinone, by Babu Rao, K. and Subba Rao, N. V., *J. sci. industr. Res.*, 1958, **17B** (6), 225.—Eight halo—and nitro-substituted α-naphthols have been oxidized using potassium nitroso disulphonate to yield the following new quinones: 6-bromo-6-nitro-, 5:7 dichloro-, 6:7-dichloro-, 2-chloro-6-nitro and 2-bromo-6-nitro-1:4-naphthoquinones. The last three quinones possess greater fungistatic activity against *Aspergillus niger* than 2:3-dichloro-1:4-naphthoquinone.

The cyto-architecture of the yeast nucleus, by Saraswathy Royan, *Proc. Indian Aca. Sci.*, 1958, **48** (1), 33.—A well-defined nuclear membrane enclosing formed structures could be observed in the living cells of *Saccharomyces cerevisiae* (NRRL, Y-567) from 120-168 hours wort cultures, under ordinary, phase contrast and dark ground illumination.

The formed structures within the nuclei correspond to the chromocentres and not the nucleoli of higher organisms.

A comparison of Feulgen and Haematoxylin stained preparations renders possible the differentiation of a pair of bodies lying within a nuclear membrane from a binucleate stage.

Iron haematoxylin preparations in which the vacuolar membrane has separated from the cytoplasm confirm the extra-vacuolar position of the nucleus.

OILS AND FATS

A new method of isolation of pure gossypol and a study of its derivatives, by Kailash Chander and Seshadri, T. R., *J. sci. industr. Res.*, 1958, **17B** (7), 279.—Aqueous borax solution removes gossypol from an ether extract of cottonseeds and it could be recipitated by treatment with mineral acid. The product is obtained in good yield and is readily purified. Pure samples of gossypol hexamethyl ether and gossypol dimethyl ether can be obtained by methylation using methyl sulphate and potassium carbonate in acetone solution and a number of repetitions of the preparations have yielded samples of constant melting points. Similarly the colourless gossypol hexaacetate has been obtained with constant properties.

TEA

Standards for green tea, by Mitra, S. N., and Roy, S. C., *J. Indian chem. Soc., Ind. & News Ed.*, 1957, **20** (3 & 4), 139.—In the manufacture of green tea, the leaves, after plucking are subjected to some form of heat treatment, such as treatment with live steam or roasting in open pans etc., and are not allowed to ferment as in the manufacture of black tea. Because of this main difference in the methods of preparation of the two types, the AA have analysed 18 genuine samples of green tea with a view to fixing up tentative standards. The maximum, minimum and average values for moisture, total ash, water solution and acid insoluble ash, water extract, alkalinity of soluble ash, crude fibre determined by the usual methods have been given. A qualitative CCl_4 test was carried out by shaking a little of powdered sample with a few c.c. of CCl_4 and allowing it to settle, when extraneous sandy and mineral matters settle down and tea floats up. Results of analysis of 7 adulterated or sub-standard samples of tea are also given. From the results, the tentative specifications summarised are as follows (on oven-dry basis): Total ash, 5-8 per cent, water-soluble ash, not less than 40 per cent of total ash; acid-insoluble ash, not more than 1 per cent; alkalinity of soluble ash, 1.3—2.5 as per cent K_2O; water extract, not less than 35.0 per cent; and crude fibre, not more than 15 per cent. These standards are preliminary in nature and are almost the same as those already fixed for black tea, the only difference being in the range of alkalinity of ash.

K.L.R.

On some aspects of quality of tea, by Siddiques, R. H., Akhtar, M. and Makhzan-ul-Ulum, *J. Indian chem. Soc., Ind. & News Ed.*, 1958, **20** (3 & 4), 143.—The quality of manufactured tea, black or green, depends on several factors such as the seasonal variations and cultural practices, conditions of manufacture, chemical composition, price and extent of adulteration. The quality in relation to each of above factors has been discussed in this paper. 14 samples of black tea and two samples of green tea obtained from the market and from the Military Food Laboratory have been analysed for nitrogen, caffeine, tannin, water-soluble ash, water-insoluble ash, iron, phosphorus and calcium contents and the results have been tabulated. The range of values according to the AA is as follows: caffeine, 1.7—3, tannins, 13.1—19.3; nitrogen, —5.1; total ash, 3.7—6.0; soluble ash, 2.1—4.1 and insoluble ash, 0.7—3.7 per Caffeine, tannin, water-soluble and fixed and essential oils are main factors which govern quality of tea. Good commerc brands like the Lipton Yellow Brook Bond Bed from the viewpoi of price, contain high nitrogen caffeine and low tannin and values. The cheaper grades showed the reverse order. Adulterati alters the composition and taste tea. The water-soluble ash va is generally taken into consideratio for the detection of adulteration. The AA suggest that the interre tionships of the extracted matter pure and adulterated tea, obtain by extraction with organic solven and water might help in decidi adulteration. The values for th extracted matter with differen solvents are given in a table.

K.L.R.

GENERAL

Coating compositions from modified Kamala seed oil, by Menon, M. C Sharma, P. G. and Aggarwal, J. S., *J. sci. industr. Res.*, 1958, **17A** (7), 279.—The suitability of kamala seed oil, modified by alcoholysis with monohydric alcohols, for the preparation of coating compositions has been investigated. The modified oil gave varnishes which were slightly inferior in hardness, drying and other characteristics to those prepared from tung oil.

PART III (Foreign)

ANALYTICAL

The composition of honey. II. Lactone Content, by White, J. W., Petty, J. and Hager, R. B., *J. Assoc. off. agric. Chem.*, 1958, **41** (1), 194.—Honey contains lactone (s) as a general component. The official A.O.A.C. acidity titration for honey is unsatisfactory because of drifting end point caused by slow hydrolysis of the lactone content. A procedure is described to determine free acidity, lactone content, and total acidity in honey, and the distribution of results of 225 analyses is given.

Losses from the use of the lead reagent in the analysis of vanilla extracts, by Englis, D., Meerman, G. and Wollermann, L. A., *J. Assoc. off. agric. Chem.*, 1958, **41** (1), 197.—Losses of vanillin from solutions of the pure material and from genuine vanilla extracts as a result of treatment with the lead reagent have been determined by use of ultraviolet spectrophotometric methods.

Under the described analytical conditions pure vanillin solutions show a loss of about 3 per cent as a result of the lead treatment. With a genuine extract, the loss is reducby 2 per cent if the lead is added a volume of 480 ml. rather than 80 ml. before diluting to the lume of 500 ml. and filtering.

From the analysis of an extract a pure vanillin solution and a ixture of equal parts of the two— of about the same vanillin con- nt—a method for estimation of e total loss from the extract is ven. It amounts to a loss of 6 per nt in the lead clarification of an tract. Subjecting standards of ire vanillin to the same lead treat- ent partially compensates for this ss. When the concentrations of e extract and lead reagent are ubled the loss of vanillin is 5 r cent greater than when the ngle concentrations are used.

Results with the clarification nployed in a previously used ocedure indicate much greater sses than those with the procedure scribed.

Further observations on the lorimetric determination of nillin, by Englis, D. T., *J. ssoc. off. agric. Chem.*, 1958, **41** (1), 3.—Variations in the amount sodium carbonate used and in e order of introduction of the re- ents have been studied for the action of vanillin with the Folin- enis reagent.

Vanillin solutions containing 5 l. of the Folin-Denis reagent and e equivalent of 1.25 g. of sodium rbonate per 100 ml. final volume solution give a satisfactory colour lue in 30 minutes. Very little fference is found whether the dium carbonate is added first or st, if the reactants are near the al volume at the time they are ought together.

Under the conditions studied a otometric evaluation is possible thout filtration, and solutions are tained which change very slowly colour value after the 30 minute riod.

AKERY

The influence of soya flour on ead doughs. III. The distri- ution of the papain-inhibiting ctor in soya-beans, by Learmonth, E. M., *J. Sci. Fd. Agric.*, 1958, **9** (5), 269.—The papain-inhibiting factor of soya is shown to be concentrated almost entirely in the germ. The cotyledon is without inhibiting power and sometimes has a slight activating effect. A similar distribution of papain-inhibiting factors is shown to exist in other leguminous seeds. Additions of 0.2 per cent to 0.4 per cent of raw soya germ alter the Chopin alveogram of the wheat flour in the same sense as do additions of oxidizing improvers.

Biscuit stability, the effect on oxidative changes of certain natural and synthetic antioxidants, by Ottaway, F.J.H. and Coppock, J. B. M., *J. Sci. Fd. Agric.* 1958, **9** (5), 294.—Antioxidants can be used in one of three ways to protect baked products against oxidative rancidity: (1) direct incorporation in the product, (2) antioxidant-impregnated papers, and (3) spraying of antioxidants.

The oxidative stability of baked products is influenced considerably by factors such as raising agent residues, flour extraction rate, moisture content and trace-metal content which can make the practical assessment of the value of an antioxidant a matter of some difficulty. The legal position regarding the use of antioxidants is briefly discussed.

Enzymes of barley and malt-III. The latent β-amylase of barley, by Pollock, J. R. A. and Pool, A.A., *J. Inst. Brew.*, 1958, **64** (2), 151.—Barley-grist which has been extracted by aqueous sodium chloride to remove free β-amylase liberates an additional amount of enzymic material on treatment with salive solutions of thioglycollic acid. The 'latent' enzyme set free in this way has been concentrated and compared with free β-amylase which it so resembles that substantial identity between the free and latent enzymes may be assumed.

K.L.R.

The addition of small amounts of defatted fish flour to whole yellow corn, whole wheat, whole and milled rye, grain sorghum and millet—I. Influence on growth and protein efficiency II. Nutritive value of the minerals in fish flour, by Sure, B., *et al.*, *J. Nutr.*, 1957, **63** (3), 409.—Data have been presented on the influence of addition of 1, 3 and 5 per cent defatted fish flour to whole yellow corn, whole wheat, whole and milled rye, grain sorghum and millet on growth and protein efficiency. The greatest responses were secured with grain sorghum, millet and whole yellow corn. The minerals in two dehydrated and defatted fish products were found to be of excellent nutritive value for growth of the albino rat.

Assay of biologic value of milk proteins by liver xanthine oxidase determination—I. Powdered products, by Mei Yu Dju, Baur, L. S. and Filer, L. J. (Jr.), *J. Nutr.*, 1958, **63** (3), 437.—Because the biologic value of milk proteins in diets prepared for infant feeding that resemble human milk in composition is difficult to evaluate by nitrogen balance methods in the rat, an indirect approach to the resolution of this problem was sought in the measurement of liver xanthine oxidase activity.

Whole egg protein and milk proteins, as processed for powdered infant foods, fed to rats either protein-depleted or transferred from a stock diet, give liver xanthine oxidase values in keeping with known biologic values reported for these two types of protein.

Liver xanthine oxidase activity reflects the biologic value of dietary proteins.

A decrease in liver xanthine oxidase is paralleled by a decrease in the content of total liver nitrogen.

Liver xanthine oxidase activity permits study of protein biologic value of diets that normally produce diarrhœa in the rat.

Prior protein depletion of the adult rat does not increase the sensitivity of liver xanthine oxidase activity as an index of protein quality.

The improvement of the protein quality of white rice by lysine supplementation, by Rosenberg, H. R. and Culik, R., *J. Nutr.*, 1958, **63** (3), 477.—The nutritive value of the protein of white polished rice can be improved significantly by supplementation with the first limiting amino acid, lysine, in amounts sufficient to bring this amino acid in balance with the second limiting amino acid.

In 5 experiments, male and female weanling rats were fed diets containing 90 per cent precooked white polished rice supplemented with graded amounts of L-lysine-HCl. Substantial improvements in growth rate and in efficiency of food utilization were obtained with 0.05 to 0.10 per cent of L-lysine-HCl supplementation. This growth response was accompanied by a decrease in the amount of fat and by an increase in the amount of protein deposited in the liver.

The drying of seaweeds and other plants. I. Through-circulation drying of *Ascophyllum nodosum*, by Merritt, J. H. and Cosgrove, E. T., *J. Sci. Fd. Agric.*, 1958, **9** (5), 300.—Tests on the through-circulation drying of ***Ascophyllum nodosum*** on a semi-commercial scale have been conducted with a batch dryer to determine the optimum conditions. It was found that there was a maximum feasible loading for rockweed of 80 per cent initial moisture content of approximately 8 lb./sq. ft. in each layer and that four layers were enough to insure full use of drying air at an air mass flow of 20 lb. dry air/min./sq. ft. The effects of variations in the fraction of air recirculated, air-flow reversal, and temperature (160-220° F) have been studied with particular reference to output and thermal efficiency. High outputs were recorded at heat consumptions of 2500 B.Th.U./lb. of water evaporated.

FISH

The potential application of antibiotics in the salmon canning industry II. Chemical and bacteriological evaluations, by Stern, J. A., *et al.*, *Food Technol.*, 1958, **12** (3), 132.—Under the conditions of this investigation, oxytetracycline and chlortetracycline retarded the spoilage of sockeye salmon. The overall storage life appeared to be extended by a factor of approximating 1.5 over the cases where no antibiotics were used. Extension of storage time was dependent on temperature. At the high storage temperatures (65 + 5° F), the absolute time of extension was relatively small, while at 32° F., the absolute time of extension was considerable. Chemical and organoleptic examination substantiated the above conclusions. Results of the bacterial examination were inconclusive, probably due to the fact that the samples were stored at freezing temperatures prior to examination. Assays for residual antibiotic activity in the canned product were negative.

The expressible fluid of fish fillets. VII—Freezing damage and protein denaturation under pressure, by Love, R. M. and Karsti, O., *J. Sci. Fd. Agric.* 1958, **9** (5), 249.—Fillets of cod were frozen at different speeds under various pressures. The effects of pressure on cell damage caused during the freezing and on denaturation of the proteins during subsequent cold storage were studied, and found to vary according to the experimental conditions. They were, however, less important than the effect of the rate of freezing, and in no cases were pressed fillets after storage inferior to unpressed in 'eating' quality. It was concluded therefore that pressure during freezing was not harmful, but could be of benefit by accelerating the freezing through improved contact between the fillets and the cooling plates.

The expressible fluid of fish fillets. VIII. Cell damage in slow freezing, by Love, R. M., *J. Sci. Fd. Agric.*, 1958, **9** (5), 257.—The action of intercellular ice on muscle cells was studied by means of the deoxyribose nucleic acid meth fish fillets frozen at different It was found that there was a zo of minimum damage at a freez time of about 115 minutes, the rapid freezing time at which all was able to form in the intercel spaces. Since the ice masses w relatively small (little bigger t the muscle cells) they did not form or damage the cells to great extent. With slower freez cell damage was found to incre to a maximum value at 200- minutes ('peak C'), and the ma by which this was brought about discussed; thereafter it decreas again. It was also found that very slow freezing the strong s solutions created by the freez out of water from the weakly sali interstitial fluids exercised conside able solvent effects on the fibr without actually breaking the open. The concentration of pr tein in the interstitial fluid tend therefore to increase in very slo freezing (freezing time about 75 minutes).

The expressible fluid of fish fillets. IX. Other types of cel damage caused by freezing, by Love, R. M., *J. Sci. Fd. Agric.* 1958, **9** (5), 262.—Cell damag occurring at a freezing time of 2 minutes ('peak A') was investigate and found to be the result of th mechanical action during freezing expansion of ice crystals of certain critical size growing within the cell. Supercooling, followed by a sudden rapid growth of ice, at the onset of freezing was foun not to damage the cells unduly. Evidence was presented to sh that the expressed fluid of c fillets originates near the cut surfa only, and does not come from th deeper layers.

FRUIT AND VEGETABLE PRODUCTS

The effect of sucrose and type of spicing on the quality of processed dill pickles, by Pa born, R. M. *et al.*, *Food Tech* 1958, **12** (3), 144.—A trained t nel observed two main flavour fects in commercially processed l pickles; high apparent acidity etic acid) and unbalanced spicing indicated by harsh flavours. onsequently, processed dill pickles ere packed with two spicings; nuine and spice oils, and at three gar levels; 1.0, 1.5, and 2.0 per nt sucrose by weight. The addi- on of 2.0 per cent sugar improved e pickle flavour quality significant- over the controls by counteract- g the apparent over-acidity and enhancing the spicing flavours. igh salt levels (4.21 and 5.03 per nt NaCl) upset the balance bet- een acid, sugar, salt, and spicing two of the samples. More salt as found to be present in the ine than in the whole pickle. ckles containing genuine spicing ere considered superior in flavour those containing spice oils. olour, texture, volatile and fixed idity, and pH were unaffected by e addition of sucrose or by the pe of spicing.

The effects of curing, storage nd dehydration on the mono nd disaccharides of the sweet otato, by Lambou, M. G., *Food echnol.*, 1958, **12** (3), 150.—hromatographic investigations are eported on the sugars in selected mples of raw sweet potatoes and heir diced dehydrated counterarts—representing freshly harvest- d, cured, and 60° F. stored stock. otal sugars extracted from the aw roots contained a major perentage of sucrose ranging from 5 per cent after curing to 66 per ent at the end of 6 months of torage. With respect to the ranges or glucose (7-11 per cent) and uctose (6-11 per cent) the higher alues were found in the stored tock. A small quantity of maltose 2.7-4.0 per cent) was found, possi- ly an artifact. A trace of inositol bserved in the freshly harvested weet potatoes increased to a naximum after one month of storage and then decreased. In the dehydrated products made from the same raw stock, maltose made up 51 to 60 per cent of the total sugars; sucrose 23 to 32 per cent and glucose, fructose and inositol smaller proportions (2.6-5.8 per cent, 2.2-4.5 per cent and 0.78-6.6 per cent respectively). The quantities varied with the condition of the raw material used. The findings, in general, confirmed those of earlier workers.

Effects of gamma irradiation on the chemical and microbial composition of fresh apple juice, by Asselbergs, E.A., *et al.*, *Food Technol.*, 1958, **12** (3), 156.—Irradiation of apple juice at 621,000 Y or lower does not produce sterile juice. After irradiation at 621,000 Y in the presence of sodium sorbate (0.05 per cent) and ascorbic acid (75 mg./100 ml.), the juices can be kept at room temperature for thirteen days without the development of micro-organisms. However, alterations in flavour, viscosity and colour seriously reduce the quality and acceptability of the juice.

Carotenoid stability in stored dehydrated carrots, by Mackinney, G., Lukton, A. and Greenbaum, L., *Food Technol.*, 1958, **12** (3), 164.—Data are presented which show that in the absence of molecular oxygen, the carotenoids of dehydrated carrots and β-carotene in a glucose-glycine synthetic mixture are unaffected by severe browning.

Effect of varied storage temperatures on micro-organisms in frozen concentrated orange juice, by Wolford, E. R., *Appl. Microbiol.*, 1958, **6** (2), 139.—Samples of orange juice concentrate were submitted to time-temperature conditions that frozen concentrated orange juice might encounter during its commercial experience. Exposure patterns were evolved and several lots of concentrate were stored under mild to severe conditions simulating these patterns.

Plate counts were found to decrease with time. The most rapid decreases were in samples subjected to the most severe temperature conditions—14 days at 20°F., followed by 7 days at 40°F. Average counts under this schedule showed only 2.6 per cent survival. Concentrate stored continuously in dry ice lost only about 14 per cent of its initial population and at—10°F 64 per cent reduction was found after 9 months.

Coliforms were found in four of five lots at the beginning of the experiment, but were practically eliminated after storage at simulated distribution patterns.

MICROBIOLOGY

Protein and fat content of some mushrooms grown in submerged culture, by Reusser, F., Spencer, J. F. T. and Sallans, H. R., *Appl. Microbiol.*, 1958, **6** (1), 1.—Ten strains of mushrooms, including four strains of *Agaricus campestris*, were grown on a synthetic medium and on media containing molasses or waste sulfite liquor. High nitrogen concentrations favoured protein production, and reduced nitrogen concentration induced fat formation. High yields of dry matter and protein were obtained on molasses medium, while yields on waste sulfite liquor were slightly lower.

Three strains produced good yields of protein when grown on waste sulfite liquor, the fermentative efficiency being approximately 15 per cent. Of these three, *Boletus indecisus* produced high yields of dry matter having a low protein content (25 per cent) and utilized a relatively high percentage of nonreducing matter. The other two strains, *Morchella hybrida* and *Tricholoma nudum*, produced lower yields of mycelium having a protein content of approximately 37 per cent.

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STUDIES IN FROZEN STORAGE OF SOME FRUIT PRODUCTS

By P. B. Mathur, K. Kirpal Singh and H. C. Srivastava

(Central Food Technological Research Institute, Mysore)

Many frozen fruits turn brown and lose flavour thawing due to the action of oxidative enzymes tannins and polyphenols. Heat blanching not desirable as it produces a 'cooked' taste and stroys the fresh flavour sought in frozen fruits. Among other chemicals, salt, citric acid and scorbic acid are known to inhibit enzyme ivity. In the present paper, these three emicals have been used in various combinations study their effect on the quality of frozen fruit oducts.

Experimental

The fruits for this investigation were obtained ect from the orchards reducing the time taken transportation to the Laboratory to the nimum. On receipt in the Laboratory, they re stored under appropriate conditions for oper ripening.

The details with regard to the various pre- atments preparatory to freezing are provided Table I. Apple slices were immersed in an ueous solution containing 1.0 per cent table t (sodium chloride) and 0.1 per cent calcium loride; the latter chemical was used to firm e slices[1-3]. In order to ensure better penetra- n of sugar and ascorbic acid, apple slices covered with syrup were subjected to a 26″ Hg. vacuum for 30 minutes[4]. All the products were packaged either in 1 lb. jam cans or A 2½ cans and were slow frozen at—20°F for 48 hours before storage at 0°F. Metal containers are preferable for packaging frozen fruit products as the container that allows air to penetrate is at a disadvantage for light coloured fruits[5].

Ascorbic acid was estimated by direct titration of suitably-prepared solutions against a standard solution of 2:6-dichlorophenol indophenol. The extent of browning was judged visually keeping in view the marketability of the various products and in order to determine the storage life at 0°F the organoleptic quality of the products was judged by a panel of 8-10 judges in each case.

Results and Discussion

The details in connection with the pre-treatments and storage lives of the various frozen fruit products are presented in Table I. Additions of ascorbic acid as an antioxidant and for fortification always resulted in retarding the rate of browning in all the fruit products investigated. This confirms the findings of Bauernfeind *et al*[6] in connection with frozen apple slices.

A few typical cases representing the changes in the ascorbic acid contents of the solid and liquid constituents of frozen fruit products during storage at 0°F are graphically shown in Fig. 1. Points representing mean ascorbic acid values of solid and liquid phases at the beginning and at the end of the storage periods have been joined by discontinuous straight lines. A perusal of these discontinuous curves shows that the losses of ascorbic acid in frozen fruit products during storage at 0°F are not very significant. Similar data have been presented by Fenton[7] for frozen asparagus, Brussels sprouts, cauliflower and beans. Another noteworthy feature brought out by Fig. 1 is that diffusion of ascorbic acid between the solid and the liquid phases takes place from the phase having the higher concentration to the phase having the lower concentration. This was not true in the case of

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TABLE 1. *Details in connection with the frozen storage of fruit products*

PRODUCT	TREATMENT					Best product	Storage life of best product at 0°F
	Dipped in	Sugar syrup, % added*	Dry sugar or salt in the ratio (by wt.), added	Citric acid, %, added†	l-Ascorbic acid, %, added†		
1. Apple (Golden Delicious), slices in sugar syrup	(i) Aqueous solution containing 1.0% table salt (NaCl) and 0.1% $CaCl_2$ for 5 minutes, rinsed in water subsequently	30	...	...	0.25‡	(ii)	10½
	(ii) ,,	,,	...	...	0.50‡		
	(iii) ,,	40	...	...	0.25‡		
	(iv) ,,	,,	...	...	0.50‡		
2. Grapes (seedless), berries in sugar syrup	(i) ...	50	...	...	...	(iii)	12
	(ii) ...	,,	...	0.5	...		
	(iii) ...	,,	...	...	0.05		
3. Jack fruit, slices	(i) ...	...	Sugar, 1:¼	...	...	(ii)	12
	(ii) ...	50	...	0.5	...		
4. Litchi (*Litchi chinensis*), peeled fruits in sugar syrup	(i) ...	50	...	...	0.05	(i)	12
5. Mango							
(A) Slices in sugar syrup							
(a) Raspuri (Peter)	(i) ...	40	...	...	...	(iv)	10½
	(ii) ...	,,	...	0.5	...		
	(iii) ...	50	...	,,	...		
	(iv) ...	,,	...	,,	0.05		
(b) Badami (Alphonso)	(i) 1% brine for 10 mts.	40	...	0.5	...	(v)	10½
	(ii) ,,	,,	...	,,	0.05		
	(iii) 0.05% ascorbic acid solution for 10 mts.	40	...	,,	...		
	(iv) ,,	,,	...	,,	0.05		
	(v) 1% brine for 10 mts.	50	...	,,	,,		
	(vi) 0.05% ascorbic acid soln. for 10 mts.	,,	...	,,	,,		
(c) Malgoa	(i) ...	40	...	0.5	...	(iv)	10½
	(ii) ...	50	...	...	...		
	(iii) ...	,,	...	0.5	...		
	(iv) ...	,,	...	...	0.05		
(B) Raspuri pulp	(i) ...	...	Sugar, 20:1	...	...	(i)	12
(C) Seedling, green, grated§							
(a) Unpeeled	(i) ...	...	...	...	...	(v)	12
	(ii) ...	...	Salt, 50:1	...	...		
(b) Peeled	(iii) ...	...	...	...	...		
	(iv) ...	...	Salt, 50:1	...	...		
	(v) ...	...	,, 20:1	...	...		
6. Orange, mandarin, peeled segments in sugar syrup	(i) ...	40	...	...	...	(vi)	12
	(ii) ...	,,	...	0.5	...		
	(iii) ...	,,	...	...	0.05		
	(iv) ...	50	...	...	...		
	(v) ...	,,	...	0.5	...		
	(vi) ...	,,	...	...	0.05		
7. Pineapple:							
(a) Rings in sugar syrup	(i) ...	50	...	...	...	(ii)	12
	(ii) ...	,,	...	...	0.05		
(b) Cubes in sugar syrup	(i) ...	,,	...	...	...	(ii)	12
	(ii) ...	,,	...	...	0.05		
(c) Juice	(i) ...	...	Sugar, 20:1	...	...	(i)	12
	(ii) ...	...	,, , 10:1	...	...		

* The ratio (by wt.) of fruit to syrup was 1:1 approximately in all cases. † On the basis of the weight of syrup

‡ The finished product was subjected to 26" Hg vacuum for 30 mts. § For the preparation of mango chutney.

grape berries, where presumably the berry skin allows no diffusion of ascorbic acid from the syrup into the berries.

Summary

Details in connection with the preparation, packaging, freezing and behaviour during storage at 0°F of some fruit products based on apple, grape, jackfruit, Litchi, mango, orange and pineapple have been described.

The losses of ascorbic acid in the various frozen fruit products during storage at 0°F were not very significant.

Acknowledgment

Our thanks are due to Dr V. Subrahmanyan, Director, for his keen interest in these investigations.

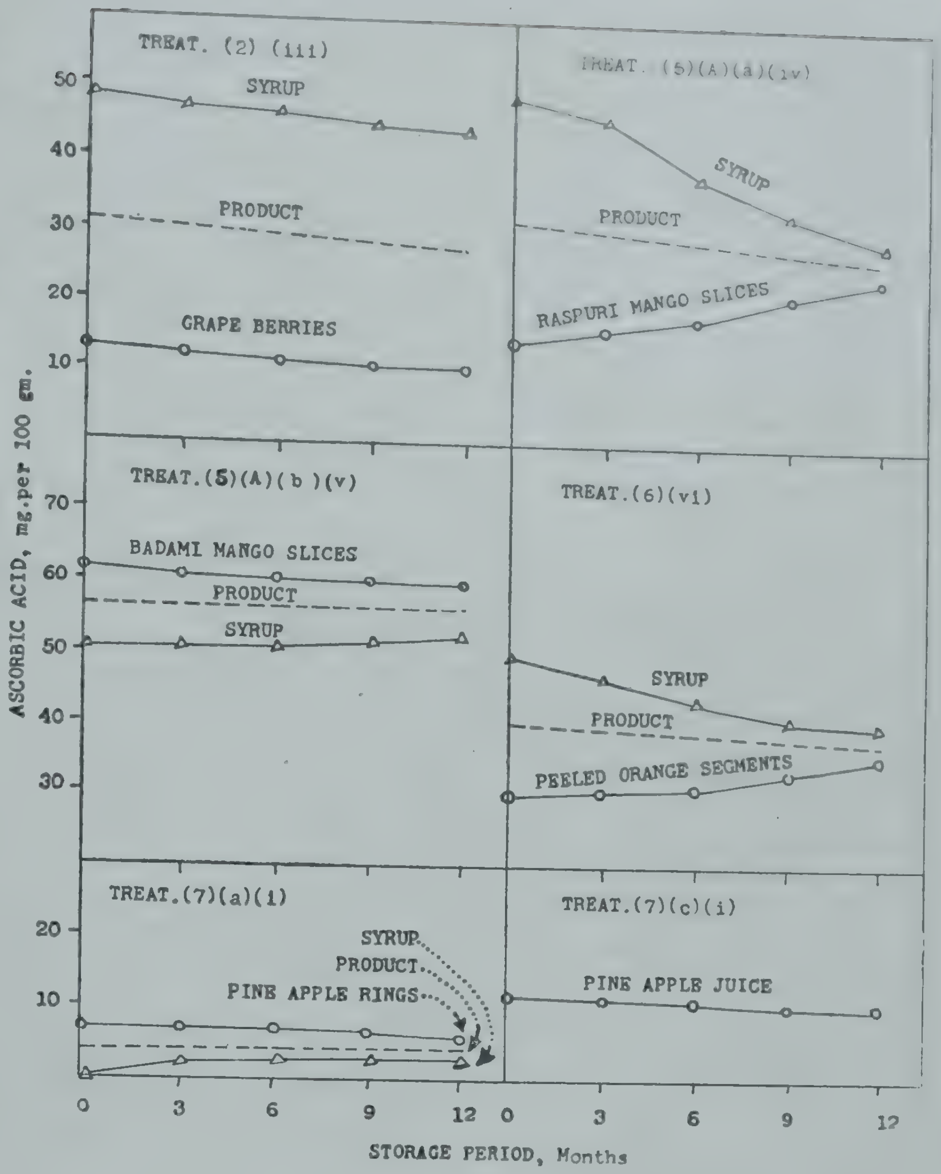

FIG. 1

Changes in ascorbic acid contents of the solid and liquid constituents of frozen fruit products during storage at 0°F.

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PRELIMINARY STUDIES ON THE REFRIGERATED GAS STORAGE OF MANGOES

It has been shown that refrigerated gas storage of apple increases the storage life of the fruit at any given temperature by about two-thirds as compared with storage in air[1-4]. Some of our choice grafted mangoes can be stored only for 6-10 weeks with the aid of cold storage[5]. It may be possible to extend the storage life of mango to 10-16 weeks under refrigerated gas storage. Since in this method the CO_2 evolved during respiration is utilized to depress the rate of respiration of the fruits, the mangoes must be placed in store and sealed up before the '*Climacteric*' rise in respiration occurs. In order to ensure this, it is essential that some method of judging the correct maturity for this purpose in the orchard should be found.

With this end in view, data concerning the relation between the diameter of the fruit and the rate of respiration at various stages of growth of two varieties of mango, viz., Badami (Alphonso) and Raspuri (Peter) were collected during 1956 and 1957.

Diameter was measured between points 1 and 2 as shown in Fig. 1 and the rate of respiration was determined by the continuous current method, the CO_2 evolved being absorbed in N/10 barium hydroxide solution which was subsequently titrated against N/10 hydrochloric acid.

The data obtained during 1956 and 1957 have been plotted in Fig. 2. In the case of Badami mango, the '*climacteric*' rise in the rate of respiration began when the fruit had attained a diameter of 6.1 to 7.7 cm. and in the case of Raspuri mango when the fruit had attained a diameter of 5.8 to 6.9 cm.

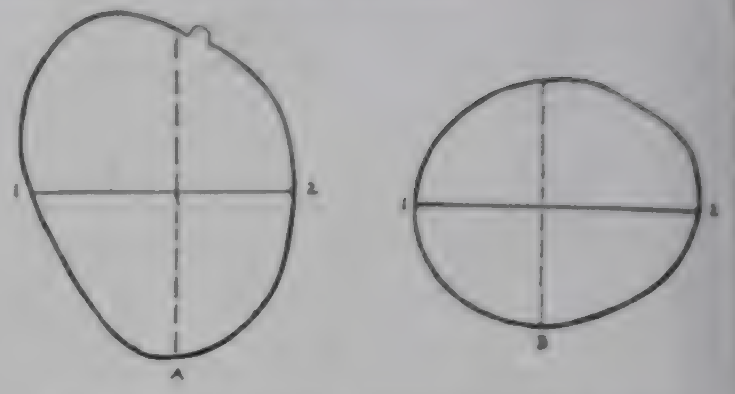

FIG. 1—Cross sections of Badami mango to show the two points (1 and 2) between which the diameter was measured

Since it is essential that at the time of picking the fruits should have attained the maximum growth, as a result of this study, it is suggested that if intended for refrigerated gas storage, Badami mangoes should be picked when a majority of the fruits on a tree have attained a diameter of 7.7 cm. and Raspuri mangoes should be picked when a majority of the fruits have attained a diameter of 6.9 cm.

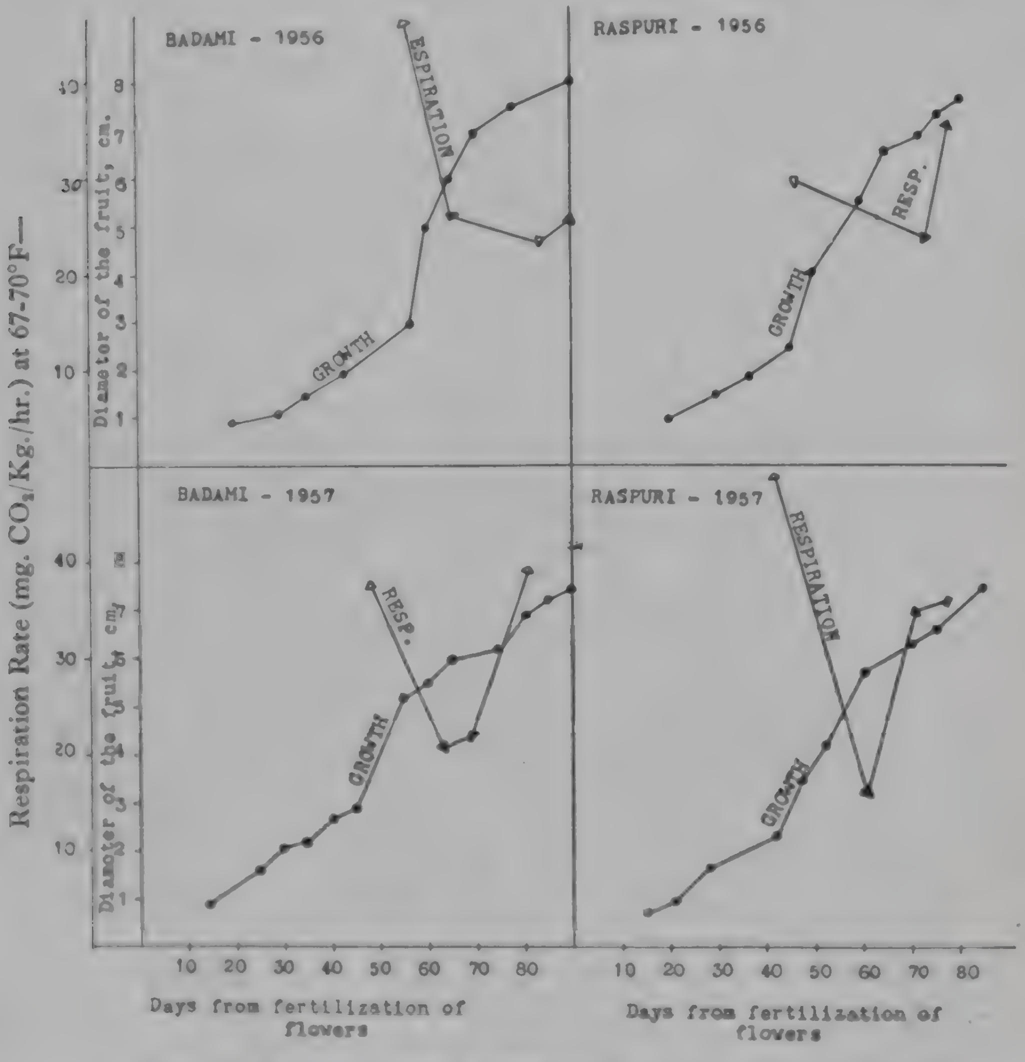

FIG. 2—Relation between growth and respiration of two varieties of mango during 1956 and 1957

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CONTROL OF FERMENTATION IN SETTLING TANKS OF SAGO FACTORIES

The manufacture of sago globules from Tapioca (*Manihot utilissima*) starch involves the preliminary processes of peeling the tubers, disintegration of the peeled material into a fine slurry, separation of the fibrous matter from the starch and sedimentation of the starch. This sedimentation is done in large cement tanks in many of the factories at Salem[1]. Since the starch slurry is left for several hours in these open tanks, microbiological contamination from air, water, adhering dust and the tubers very frequently cause fermentation resulting in off-odours and undesirable changes in the material. The resulting heavy microbiological load on the sago globules is also very objectionable.

Some experiments were therefore tried in the laboratory to find out an effective and simple way of checking excessive microbial growth in tapioca starch slurries for periods of 24-72 hours. Spoiled material kept in open buckets, beakers etc., invariably showed the presence of bacteria and yeasts. *Oidium*, *Sacchoromyces*, *Lactobacillus* and *Bacillus* were the most commonly found genera of organisms.

A number of chemicals were tried at different levels for effective prevention of microbial spoilage. The same types of organisms were found when the samples of sago granules from the various factories in Salem were examined bacteriologically.

Results are given in Table I.

Table I—*Observations with different chemicals*

Chemical	Concentration	First signs of spoilage observed after
Potassium metabisulphaite + Hcl ...	50 p.p.m. SO_2	24 hours
	150 ,,	48 ,,
SO_2 in water ...	150 ,, So_2	48 ,,
	200 ,, So_2	48 ,,
Bleaching powder ...	10 ,, Cl_2	24 ,,
	20 ,, Cl_2	48 ,,
Sodium benzoate ...	0.025%	24 ,,

Chlorine produced discolouration of the starch while sodium benzoate at higher levels was considered objectionable.

Results indicated that about 50—100 p.p.m. of SO_2, either as gas or as pot. metabisulphite with HCl added after the first 12-24 hours storage was most effective in suppressing excessive microbial growth for 48—72 hours. Addition of another dosage of 50 p.p.m. of SO_2 after the 48 hour period ensures the 72 hour non-spoilage period.

Where production warrants, the cheapest method of using SO_2 would be to burn sulphur in special burners.

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CHEMICAL ANALYSIS OF SOME VARIETIES OF INDIAN PEPPER (*PIPER NIGRUM L*)

By C. T. Dwarakanath, T. N. Ramachandra Rao and D. S. Johar

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The pepper vine, *Piper nigrum* L, is grown in Kerala, Mysore and parts of Madras State. The total area under pepper cultivation in India is 200,000 acres with an annual production of about 25,000 tons. Both black and white pepper are the products of the same plant. Black pepper refers to berries which are picked before they are fully ripe and dried. White pepper is produced by soaking ripened berries in water, decorticating and drying them. A large number of pepper varieties are cultivated in India which have a localised distribution from very early times. The distribution of recognised pepper varieties on a regional basis is as follows:

I. Travancore and Cochin

Cheriakanaikadan;
Chola;
Karuvilanchi;
Valaikanikkadan;
Kothanadan;
Karimunda;
Kuthiravalli;
Perumkodi; Chumala;
Narayakodi;
Kumbhakodi;

II. North Kanara

Malligasera;	*Doddagya;*
Morata;	*Kare Malligasera;*
Arisina Morata	

III. Malabar and South Kanara

Kalluvalli;	*Kottavalli;*
Cher iakodi;	*Balankotta;*
Karinkotta;	*Uthirankotta*

The quality of pepper is dependent on its active principles so that it has to conform to the food and drug laws of the importing countries.

The commonwealth food specifications for black pepper are:

	Not less than (per cent)	*Not more than* (per cent)
Ether soluable extract ...	6	...
Absolute alcohol extract ...	8	...
Total ash ...	...	7
Ash insoluble in hydrochloric acid ...	...	1.5

A survey of the literature revealed that so far no data is available about the active chemical constituents present in the pepper varieties grown in India.

Hence, it was thought desirable to collect pure samples of these varieties and analyse them for the following constituents: (*i*) Moisture (*ii*) Starch (*iii*) Ether extract (*iv*) Alcohol extract (*v*) Crude fibre (*vi*) Total nitrogen and (*vii*) Ash.

Materials and Methods

Out of the 20 varieties mentioned above only II could be procured and have been taken up for study of their chemical analysis which was carried out according to the methods outlined in A.O.A.C (1).

The results of the analysis are presented in Table I.

Results and Discussion

Taking the '*non-volatile ether extract*' it is noticed that for a specified percentage of 6, only *Uthirankotta* has a value of 5.7 well near it. It is interesting to note that this vine bears only unisexual flowers and is therefore generally to

TABLE I. *Analysis of some varieties of pepper grown in India*

Sl. No.	Name of the Variety	Producing Region	Moisture %	Total Nitrogen %	Nitrogen in 100 g of non-volatile ether extract	Protein (N × 6.25) %	Ether Extracts		Alcohol extract %	Crude fibre %	Ash			Starch % by acid hydrolysis
							Volatile ether extract %	Non-volatile ether extract %			Total ash %	Water soluble ash %	Acid insolubel ash %	
1.	Kottandan ...	Kerala	10.8	2.08	3.61	13.00	2.2	11.1	12.0	17.1	5.0	3.1	0.32	33.3
2.	Kumbhakodi ...	Kerala	12.1	2.27	3.59	14.18	1.8	11.2	11.0	14.5	5.0	2.9	0.03	37.8
3.	Kuthiravally ...	Kerala	10.0	2.04	3.71	12.75	0.9	11.4	11.0	18.0	4.5	2.5	0.15	38.2
4.	Perumkodi ...	Kerala	12.6	1.87	3.55	11.68	1.1	9.5	9.3	13.8	4.0	2.1	0.35	34.8
5.	Karuvilanchi ...	Kerala	12.2	2.13	3.69	13.31	2.0	8.6	10.0	13.1	4.4	2.5	0.33	33.9
6.	Chumula ...	Kerala	11.7	1.79	3.33	11.18	0.6	7.9	8.3	13.9	3.6	2.0	0.35	41.8
7.	Uthirankotta ...	Malabar	9.9	2.18	3.72	13.62	0.3	5.7	5.4	9.5	4.0	2.6	0.11	39.6
8.	Karivally ...	Malabar	12.5	1.71	3.68	10.68	1.7	8.6	8.6	13.6	4.5	2.8	0.03	39.3
9.	Balankotta ...	Malabar	9.8	2.13	3.53	13.31	0.5	6.8	7.2	16.5	4.2	2.3	0.42	38.0
10.	Tulakodi ...	Malabar	9.8	1.94	2.70	12.12	0.5	7.6	9.7	11.8	3.8	2.0	0.38	36.4
11.	Kalluvally ...	Coorg	8.7	2.43	4.22	15.18	1.4	7.1	9.3	15.2	5.0	3.3	0.37	40.0

be avoided in propagation. Five other varieties have a value between 6.8 and 9.5 per cent. The best varieties seem to be those with values above 11.0, namely *Kottanadan*, *Kumbhakodi* and *Kuthiravally*.

The figures for '*alcohol extract*' also run parallel to ether extract. The standard figure is 8 and two varieties namely *Uthirankotta* and *Balankotta* have values of 5.4 and 7.2. The middle group is formed by those which have values ranging from 8.3 to 10.0. The best varieties are those with values above 11.0. The ether and alcohol extracts are only a rough indication of the total alkaloid present in the crude form in the pepper. Hence it is desirable to propagate and use as stock material, only those varieties which give high values for ether and alcohol extracts.

The two other factors to be considered are *total ash* and *acid* (*hydrochloric*) *insoluble ash*. The maximum limits allowed for these characteristics are 7 and 1.5 per cent and it is found that all the eleven varieties studied are well within the limits.

Summary

(*i*) The only two varieties which give values below specified standards for alcohol and ether extracts are *Uthirankotta* and *Balankotta*.

(*ii*) The best varieties from among those analysed with a view to highest percentage of crude piperine are; *Kottanadan*, *Kumbhakodi* and *Kuthiravally*.

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UTILIZATION OF TAPIOCA FLOUR AND LOW-FAT GROUNDNUT FLOUR IN MEETING THE FOOD SHORTAGE

By V. Subrahmanyan and M. Swaminathan

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One of the most important problems of India and many East and South East Asian countries, in general, is the provision of adequate quantities of cereals in the diet to meet the calorie requirements of the people. The total production of food grains has no doubt been steadily increasing as a result of employing improved methods of irrigation and agriculture but the demand from the rapidly growing population has increased to a greater extent. As a result of this, the estimated per capita National cereal supplies have remained more or less the same[1] and countries like India have to import food grains continuously to make up the shortage. In view of the high cost involved in importing food grains, it has become increasingly necessary to make up the cereal deficit by using subsidiary foods. Among these, the most promising are the roots and tubers e.g., tapioca, sweet potato and potato which yield two to three times as much calories per acre as cereals[2]. Low fat groundnut flour which is available abundantly as a by-product of the groundnut oil industry could also be used as a protein supplement to tuber and cereal flours. Several Asian countries viz., Japan, China, Indonesia, Malaya and Ceylon have made efforts to make up the cereal shortage by increasing the production and consumption of high yielding tuber crops like sweet potato and tapioca. The average *per capita* consumption of roots and tubers in these countries has been estimated to be well over 5-6 ounces per day[1]. The Irish national Nutrition Survey has revealed that the average *per capita* consumption of potato in Ireland ranges *from* 12 *to* 30 *ounces* per day[3]. The average daily per capita consumption of potato on the continent varies from 10 ozs. in Switzerland to 20 ounces in Belgium[4]. The above account shows that roots and tubers are being widely used in substantial quantities in several Asian and European countries for making up the shortage in the supply of cereals. It is therefore obvious that by increasing the production and consumption of roots and tubers, it is possible to make up the shortage in the supplies of cereals in India.

In view of the increasing urgency of the food problems in the country, investigations were carried out in this Institute during the last 6 years on the utilisation of subsidiary foods like tapioca and groundnut flours as partial substitutes for cereals[5-9]. The results have shown that (1) a blend of tapioca flour and groundnut flour in the ratio of 3:1 can be used admixed with wheat, and other common cereal flours upto an extent of 25-30 per cent in several common Indian food preparations as a partial substitute for cereals. (2) Macaroni products prepared from a blend of tapioca flour 65 parts, low fat groundnut flour 15 parts and 25 parts of wheat flour can be used as a substitute for rice in daily diets. In the present review a brief account of the results so far obtained is presented.

Effect of partial replacement of cereals by tapioca flour and a blend of tapioca flour (75 parts) and low fat groundnut flour (25 parts) on the nutritive value of diets

Animal experiments

The effect of replacing 25 per cent of rice wheat and ragi in poor Indian diets by tapioca flour or by a blend of tapioca flour (75 parts) and low fat groundnut flour (25 parts) on the growth of albino rats was first studied[5]. The results showed (1) substitution of rice, wheat or ragi by tapioca flour to the extent of 25 per cent in poor vegetarian diets does not lead to any deterioration in the overall growth-promoting value of the diet in albino rats (2) substitution of the above grains by a blend of tapioca flour (75 parts) and groundnut flour (25 parts) to the extent of 25 per cent in poor vegetarian diets, brought about a significant improvement in the nutritive value of the diets as judged by the growth of rats. The data regarding the chemical composition of tapioca flour and low fat groundnut flour and their blends with cereals is given in Table I. The results of animal experiments are shown in Table II.

TABLE I. *Chemical composition of cereals, tapioca flour and low fat groundnut flour and their blends (values per 100g)*

Sl. No.	Name of flour	Protein (Nx 6.25) (g)	Fat (g)	Carbohydrate (by diff) (g)	Calorific value	Calcium (g)	Phosphorus (g)	Iron (mg)	Thiamine (mg)	Riboflavine (mg)	Nicotinic acid (mg)
1	Low fat groundnut flour ...	49.8	8.9	20.8	374	0.07	0.50	6.0	0.95	0.20	19.5
2	Tapioca flour ...	1.7	0.3	83.1	353	0.06	0.08	4.4	0.12	0.11	1.8
3	Mysore flour, tapioca flour (75 parts) and groundnut flour (25 parts) ...	13.8	2.7	69.8	363	0.06	0.18	3.6	0.31	0.07	5.4
4	Whole wheat flour ...	12.1	1.7	72.2	353	0.04	0.32	7.3	0.54	0.12	5.0
5	Whole wheat flour (75 parts) + tapioca flour (25 parts) ...	9.4	1.3	74.9	353	0.05	0.26	6.5	0.44	0.10	4.3
6	Whole wheatflour (75 parts) + tapioca flour (20 parts) + groundnut flour (5 parts)	11.8	1.7	72.8	354	0.05	0.28	6.6	0.48	0.10	5.2
7	Jowar flour ...	10.4	1.9	74.0	355	0.03	0.28	6.2	0.35	0.09	1.8
8	Jowar flour (75 parts) + tapioca flour (25 parts) ...	8.2	1.5	75.8	356	0.04	0.23	5.8	0.29	0.08	1.9
9	Jowar flour (75 parts) + tapioca flour (20 parts) + groundnut flour (5 parts) ...	10.6	1.9	73.7	357	0.04	0.25	6.9	0.33	0.08	2.8
10	Ragi flour ...	7.1	1.3	76.3	345	0.33	0.27	5.4	0.42	0.10	1.1
11	Ragi flour (75 parts) + tapioca flour (25 parts) ...	5.7	1.1	78.1	347	0.26	0.22	5.2	0.36	0.09	2.3
12	Ragi flour (75 parts) + tapioca flour (20 parts) + groundnut flour (5 parts) ...	8.2	1.5	76.0	348	0.26	0.25	5.3	0.39	0.09	2.3
13	Rice, raw milled ...	6.7	0.3	80.2	351	0.01	0.13	2.0	0.12	0.04	1.1
14	Rice, raw milled (75 parts) + tapioca flour (25 parts) ...	5.4	0.3	81.0	352	0.03	0.12	2.6	0.12	0.04	1.4
15	Rice, raw milled (75 parts) + tapioca flour (20 parts) + groundnut flour (5 parts) ...	7.8	0.7	78.9	353	0.02	0.14	2.7	0.16	0.04	2.3

TABLE II. *Effect of replacing rice and other cereals by tapioca flour or Mysore flour* on the growth of rats*

Main ingredients in the diet†	Protein content of diet (on dry basis) (%)	Average weekly of growth (g)
Series—I		
1. Raw milled rice 78.5%	8.4	4.9
2. Rice 58.9% + Tapioca flour 19.6%	7.2	7.2
3. Rice 58.9% + Tapioca flour 15.7% + groundnut flour 3.9%	9.6	9.0
4. Mysore flour 78.5%	13.2	10.5
Series—II		
1. Wheat 78.5%	13.9	9.9
2. Wheat 58.9% + Tapioca flour 19.6%	10.9	10.2
3. Wheat 58.9% + Tapioca flour 15.7% + groundnut flour 3.9%	13.6	10.3
Series—III		
1. Ragi 78.5%	8.9	8.4
2. Ragi 58.9% + Tapioca flour 19.6%	7.8	7.6
3. Ragi 58.9% + Tapioca flour 15.7% + groundnut flour 3.9%	9.9	10.9

* A blend of tapioca flour (75 parts) and groundnut flour (25 parts) is also known as 'Mysore flour'.

† The other ingredients in the diets were: Red gram dhal (*Cajanus cajan*) 5.0%; Leafy vegetables 2.1% Non-leafy vegetables 8.2%; Milk powder (skimmed) 0.9%; Common salt 0.3%; Groundnut oil 5.0%.

Feeding experiments on children

Feeding experiments were conducted on children in order to assess the effects of replacement of (1) 25 per cent of rice in the diet by tapioca flour and (2) 50 per cent of cereals (wheat and jowar) in the diet by a blend of tapioca flour (75 parts) and groundnut flour (25 parts) on the growth and nutritional status of children[6, 7].

In the first experiment[6] the children in the rice group received 8 ounces of rice while the children in the rice-tapioca group received 6 ounces of rice and 2 ounces of tapioca flour. The other ingredients in the diets were the same. Height, weight, haemoglobin and red blood cell count of blood and nutritional status were assessed at the beginning and end of the experimental period of 6 months. The results (Table III) showed that there was no significant difference between the two groups in respect of any of the characteristics studied.

TABLE III. *The effect of partial replacement of rice in a poor rice diet by tapioca flour on the growth and nutritional status of children*
(Duration of Experiment: 6 months)

Characters	Average increase in 6 months	
	Rice group	Rice-tapioca group
Height (inches)	0.66	0.68
Weight (pounds)	1.07	1.30
Haemoglobin (g/100 ml blood)	−0.70	−0.15
Red blood cells (10^6/cu.mm)	0.18	0.09

In the second experiment[7] the children in the control group received 9 ounces of cereals consisting of rice 3.2 ozs. ragi 1.3 ozs. wheat 2.25 oz. and jowar 2.25 ozs. The experimental group was given 4.5 ozs. of a blend of tapioca flour and groundnut flour (also known as Mysore flour) in place of wheat (2.25 ozs.) and jowar (2.25 ozs.). The other ingredients in the two diets were the same. All the children relished the blend of tapioca and groundnut flours. The experiment lasted for a period of 6 months. The results (Table IV) showed that there was no significant difference between the two groups in respect of any of the characters measured except the haemoglobin which showed a significant increase ($P < 0.05$) in favour of the tapioca-groundnut flour diet.

TABLE IV. *The effect of partial replacement of cereals (wheat and Jowar) in a poor Indian diet by Mysore flour on the growth and nutritional status of children*

Characters	Average increase in 6 months	
	Rice-wheat-jowar diet	Rice-Mysore flour diet
Height (inches)	0.62	0.67
Weight (pounds)	1.70	2.61
Red blood cell (10^6/cu.mm)	0.20	0.27
Haemoglobin (g/100 ml. blood)	0.42	0.66

The results showed that (1) 25 per cent of rice in the diet could be replaced by tapioca flour without affecting the growth, general health and nutritional status of children and (2) 50 per cent of cereals (wheat+jowar) in the diet could be replaced by a blend of tapioca flour and groundnut flour in the ratio of 3:1, without affecting the growth and health of children.

Feeding experiments on adult human beings

The effect of replacing 25 per cent of rice in the diet by tapioca flour on the metabolism of nitrogen, calcium and phosphorus in adult human beings was next studied[8].

The results (Table V) showed that (1) the average retention of nitrogen on the rice-tapioca diet was almost equal to that observed on the rice diet (2) the average retention of calcium and phosphorus on the rice-tapioca diet was significantly greater than that observed on the rice diet. It may be therefore concluded that 25 per cent of rice in the diet of adults could be replaced by tapioca flour without affecting adversely the retention of nitrogen, calcium and phosphorus.

TABLE V. *Metabolism of nitrogen, calcium and phosphorus on rice and rice-tapioca diets in adult human beings.*

Diet	Intake (g)	Retention (g)
Nitrogen		
Rice ...	9.69	2.65
Rice-tapioca ...	8.93	2.75
Calcium		
Rice ...	0.529	0.047
Rice-tapioca ...	0.586	0.153
Phosphorus		
Rice ...	1.155	0.196
Rice-tapioca ...	1.178	0.470

Large scale feeding experiments with blend of tapioca flour and groundnut flour (Mysore flour) in distress areas of Madras State.

Large scale feeding experiments with a blend of tapioca flour (75 parts) and groundnut flour (25 parts) (Mysore flour) were carried out in distress areas of Kadiri taluq in the Anantapur district of the former Madras State for a period of 3½ months during the year 1953[9].

The blend of tapioca flour and groundnut flour (Mysore flour) was given to the people in the form of gruel. The gruel was prepared by cooking 100 parts of Mysore flour, 20 parts of broken wheat and 12 parts of germinated green gram with the required amount of boiling water. Salt was added to taste. Each individual attending the gruel centre received daily gruel containing 3.75 oz. of Mysore flour, 0.75 oz. of broken wheat, 0.43 oz. of germinated green gram and 0.38 oz. of common salt. The gruel supplied about one-third the daily requirements of proteins and B-complex vitamins and increased to a considerable extent the intake of calories, proteins, minerals and vitamins in which the basal diet consumed by the people were deficient. The investigation showed that the gruel prepared from 'Mysore flour' was relished by the people attending the gruel centres. There was so complaint of any digestive trouble by the consumers. The general health of the children receiving Mysore flour gruel was similar to that of children receiving the gruel prepared out of wheat and rice. It can be concluded from the results of this investigation and also from those of the institution feeding experiments mentioned earlier that both in normal times as well as during periods of food scarcity a blend of tapioca flour and groundnut flour (Mysore flour) can be used as a partial substitute for cereals.

TABLE VI. *The chemical composition of tapioca macaroni as compared with that of raw milled rice.* (Values per 100g)

Constituent	Tapioca-macaroni	Raw milled rice
Moisture (g) ...	10.8	12.1
Protein (N × 6.25) (g) ...	11.3	6.8
Fat (g) ...	1.8	0.4
Fibre (g) ...	0.6	0.2
Ash (g) ...	1.9	0.5
Carbohydrate (by diff) (g) ...	73.6	80.0
Calcium (mg) ...	53.5	10.0
Phosphorus (mg) ...	144.6	132.5
Iron (mg) ...	3.0	1.2
Thiamine (mg) ...	0.21	0.12
Nicotinic acid (mg) ...	3.6	1.3
Riboflavin (mg) ...	0.07	0.02

TABLE VII. *The effect of replacement of rice in the diet by tapioca macaroni on the growth and nutritional status of children* (Duration of experiment 6 months)

Characteristic ..	Average increase in 6 months	
	Rice group	Tapioca-macaroni group
Height (inches) ...	0.61	0.62
Weight (pounds) ...	1.83	1.94
Haemoglobin (g/100ml. of blood) ...	−0.17	0.13
Red blood cells (10^6/cu.mm)...	0.17	0.12

Tapioca macaroni products as partial substitutes for rice

Recently a process for the preparation of tapioca macaroni in the shape of rice from a blend of tapioca flour 60 parts, wheat flour 25 parts and groundnut flour 15 parts was standardised in this Institute[10]. At the beginning, this product was referred to as 'synthetic rice' and later on, the name has been changed to tapioca macaroni, as the process is essentially similar to that followed in the manufacture of macaroni products from wheat semolina[11] (Table VI). Further trials have shown that besides the rice shape, other forms such as shells, tubes, sago like granules, vermicelli etc., can also be made from the same blend on a commercial macaroni press using different dies. Experiments on albino rats showed that a poor vegetarian diet based on the rice shaped tapioca macaroni promoted significantly higher rate of growth in albino rats than a similar diet based on raw milled rice[12]. Feeding experiments were conducted on children for a period of 6 months in order to assess the effect of replacing completely rice in a poor vegetarian diet by tapioca macaroni, on their growth, general health and nutritional status[13]. In this experiment, the children in the rice group received 8 ozs. of rice, while those in the tapioca macaroni group received 8 oz of tapioca macaroni. The other ingredients in the diets were the same. Tapioca macaroni was cooked and consumed in the same way as rice. The results Table VII showed that there was no significant difference between the two groups in respect of growth, general health and nutritional status and that the product was highly acceptable as a substitute for rice. All the children in the experimental group relished the tapioca-macaroni and none complained of any digestive trouble. Studies on the metabolism of nitrogen, calcium and phosphorus in children on the two diets revealed that the average retention of nitrogen, calcium and phosphorus of children on the tapioca macaroni diet was greater than that observed in children on the rice diet[14] (Table VIII). More recently the production of rice-shaped tapioca macaroni on a pilot plant scale has been carried out in this Institute. Large scale consumer acceptability trials of the product conducted in Kerala State by the State Government in collaboration with our Institute, have revealed that the product is generally acceptable to the people. The State Government is at present importing large amounts of rice at considerable expense. Since large quantities of tapioca are being cultivated in the state, the state government can manufacture on a large scale tapioca macaroni products and thus make up the rice shortage to a considerable extent. Plans for setting up a plant for producing 20 tons of tapioca macaroni are underway. It is hoped that large scale production and consumption of blends of tapioca flour and groundnut flour and also of tapioca macaroni products will help considerably in overcoming the shortage of cereals in the country.

TABLE VIII. *Average daily intake and retention of nitrogen, calcium and phosphorus in children on the rice and tapioca macaroni diets*

Diet	Intake	Retention
Nitrogen (*g*)		
Rice	4.528	0.786
Tapioca macaroni	6.240	0.941
Calcium (*mg*)		
Rice	285	29
Tapioca macaroni	380	93
Phosphorus (*mg*)		
Rice	547	83
Tapioca macaroni	562	107

Conclusion

Judging from the present trends of increase in food production and of population[1], there is every possibility that the production of cereals in the several Asian countries will not be able to cope up with the increasing demands of the growing population. The need for finding alternative food sources which can be used as partial substitutes for cereals is being increasingly appreciated by the Governments concerned. Roots and tubers appear to be the most promising sources as they yield about 2 to 3 times as much calories per acre as cereals. They possess the added advantage that they can be cultivated both as kitchen garden crop and on a field scale. The investigations referred in the present paper have clearly demonstrated that blends of a tuber flour and low fat oilseed flours could be used with advantage as partial substitutes for cereals. Successful efforts to meet the cereal shortage by increasing the production and consumption of rootcrops have already been made in Japan, China, Indonesia and Ceylon. This line of approach holds out great possibilities for the future in providing the people with adequate food supplies.

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E (IS) 22

Intestinal synthesis of B-complex vitamins-a review, by R. Rajagopalan, (*August* 16, 1958). The speaker reviewed the work so far done on the intestinal synthesis of B-complex vitamins and also presented some data obtained by him and his colleagues on the intestinal synthesis of thiamine as influenced by different diets and on the role of antibiotics (penicillin) in the nutrition of the rat.

Intestinal synthesis of B-complex vitamins is a problem of considerable importance due to the fact that all of us stand to derive substantial benefits by such a synthesis. Early investigators regarded the intestinal bacteria as saphrophytes whose putrefactive metabolic products were harmful and responsible for the gastro-intestinal disorders. Later it was recognised that the acid producing species were desirable for proper conditioning of the intestinal tract.

The present status of the problem was due essentially to the rather speculative views expressed by Pasteur in 1885 that intestinal bacteria were closely connected with the longevity of the host. Subsequent experimental evidence supported this view though in recent years sterile rats have been maintained.

Osborne and Mendel described the phenomenon of 'Cophrophagy' and showed that faeces of rats contained a factor which was thermostable and which was able to overcome the adverse effect of the diet producing cophrophagy. Portier and Randoin subsequently demonstrated that the faeces of rats receiving a B-complex deficient ration contained the growth factors. Bottomly showed that bacteria produced factors responsible for adequate growth of wheat seedlings. Pacini and Russell reported for the first time that the typhoid bacilli left in the medium in which they were grown, a nutrient factor responsible for producing adequate growth in rats devoid of B-complex vitamins.

Fredrici a and Roscoe independently made the observations on 'Refection' which indicated a predisposition to absorption of the growth factors elaborated by the intestinal bacteria. It was found that rats on purified diets containing a high percentage of uncooked rice or potato starch showed the characteristic symptoms of vitamin deficiency. But, some of these rats made a spontaneous recovery. When the faeces of these rats were given to the other animals, they also recovered. Fredricia advanced the hypothesis that the recovery of the rats was due to the implantation of B-complex producing microorganisms in the gut of the animals.

The experimental evidence on 'refection' enabled further development of the subject. A large volume of work has been done and the accumulated evidence obtained so far indicates convincingly that bacteria of the intestinal tract synthesise B-complex vitamins which are absorbed and utilised, for the metabolic requirements of the host. It is also clear that the extent of synthesis is governed by diets and dietary factors which exert a profound influence on the type of bacteria developing in the intestinal tract.

The speaker then dealt with the work done using different carbohydrates. Dextrinited starch was found to lead to the maximum synthesis of vitamins. The simple sugars which were readily digested did not help in the synthesis of vitamins. Sucrose was actually found to produce a vitamin deficiency condition. The presence of vitamins in the intestinal tract generally favoured the multiplication of spore bearing species as a result of which there was greater synthesis.

With the introduction of sulpha drugs, particularly of sulphaquanidine as a bacteriostatic agent, it became possible to study many problems associated with intestinal synthesis. The extent of synthesis under a variety of conditions and the benefit to the host as a result of the synthesis could all be assessed.

The results of studies on four types of diets—rice, rice-fish, wheat and ragi-rice were presented. The diet which brought about the maximum growth response was found to be responsible for the greatest synthesis of thiamine.

Elucidating the role of antibiotics in nutrition, the speaker presented data to show that oral feeding of penicillin did increase the growth response. There was increased urinary and faecal excretions of thiamine. With the support of *in vitro* studies, it was concluded that penicillin was not responsible for increasing thiamine synthesis, but destroyed those bacteria which competed with the host for the available sources of thiamine, thereby a greater quantity of the vitamin was available for the host.

During the lively discussion that followed, the speaker pointed out that it was fairly well established that dietary factors were responsible for the changes in the type and number of intestinal flora. It was possible that some of these types of bacteria synthesising the B-complex vitamins also brought about some harmful effects but there was no means of regulating them. Intestinal synthesis definitely contributes a substantial part of the daily requirement. Consumption of curds is an age-long practice. This leads to enhanced synthesis of most of the B-complex vitamins. It is too much to say whether the bacteria that develop in the intestines as a result of feeding curds, are also harmful.

Dealing with the role of antibiotics in nutrition, the speaker gave the details of the early work and stated how the 'infection' theory proposed by Coates and her associates explained the differences in the experimental data reported by the investigators in the field.

Winding up the discussion, the President said that the problem was very important and deserved careful and systematic study. He also stressed the need to study the effect of other antibiotics besides penicillin in the nutrition of the rat.

S (IS) 23

Influence of curds on the intestinal synthesis of thiamine, by B. R. Baliga, (*August* 2, 1958). Introducing the subject, the speaker said that earlier workers had observed that supplementation of curds to the diet of rats led to proliferations of intestinal microflora, particularly coliforms. In a controlled experiment, it was shown that the rats receiving a supplement of curds benefited by way of enhanced synthesis of thiamine as a result of the increased density of intestinal microflora, as shown by increased urinary and faecal excretion of thiamine, increased liver store of thiamine and increased growth. They also showed that curds reverses the bacteriostasis due to sulfaguanidine and that this reversal was not dependent on the para amino benzoic acid content of the curds supplement, but on its general influence favouring proliferation of intestinal microflora.

Since these observations were liable to the criticism that the intake of B-complex vitamin of the control and curds supplemented group was not equal, the whole problem was re-investigated under controlled schedule. The data obtained from these studies showed improved excretion of thiamine in urine and faeces and enhanced storage of the vitamin in liver. There was no significant increase in growth between the two groups. Proliferation of coliforms due to supplementation with curds occurred in the present experiment also. Since the increase in urinary and faecal excretion of thiamine could not be due to faulty absorption and utilisation of thiamine, based on the liver stores of the vitamin, the speaker concluded that a fair amount of thiamine from bacterial synthesis in the intestines is absorbed and made available for the metabolism of the host.

With a view to evaluating the extent of benefit derived from the increased intestinal synthesis consequent on curds supplementation, a group of rats receiving curds supplement and restricted to an intake of 10 μg. B_1/rat/day, was compared to three other groups with thiamine intakes restricted to 10, 15 and 20 μg. B_1/rat/day, but without curds supplement in an experiment planned like bioassay of a vitamin. The curds supplemented group was at par with the group restricted to 15 μg. B_1/rat/day.

The speaker referred to the possibility of the increased excretion and storage observed in animals receiving curds, being related to a protective action of curds against destruction or inactivation of thiamine during the active phase of digestion and absorption, thereby making all or a major part of the intake available for absorption and utilization.

To test this, the effect of curds feeding was followed in cecectomised rats *i.e.*, where the portion of intestine showing maximum bacterial density has been removed. Curds supplementation did not have any beneficial influence in cecectomised rats. This overrules the possibility of curds exerting any protective action against destruction or inactivation of thiamine in the gastro intestinal tract. Moreover, in this expriment curds supplementation did not lead to proliferation of intestinal coliforms.

The speaker stated that in similarly planned experiments, it was observed that the host could get significant amounts of riboflavin, pantothenate and vitamin B_{12} from the increased intestinal synthesis brought about by curds supplementation. Soyabean curds did not confer a similar benefit.

In the discussion that followed, it was indicated that bacteria of the coliform species were responsible for acid and gas production and as such could not be considered quite safe as habitants of the intestinal tract. It was pointed out that certain members of the coliform group of bacteria were known to be responsible for synthesising B-complex vitamins. With the information available at present, it was not possible to say whether the coliforms developing as a result of curds feeding were only concerned with synthesis of vitamins or whether these also brought about acid and gas production. The exact mode of action of curds is under study.

The inoculation of the milk was done in the usual way with curds. The types of bacteria used for the inoculation were not studied. It was felt that a study using known types of bacterial cultures for the inoculation would yield useful information. The medium used for the enumeration of coliforms was Mackonky agar.

Winding up the discussion, the President stated that the nature of the inoculum used for making curds is very important in a study of this nature as it influences the nature and content of intestinal flora.

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Guar gum

E (IS) 78

Kindly let me know the information available with you on 'Guar gum' (Calcutta).

'Guar gum' is obtained from the seeds of the plant *Cyamopis tetragonoloba*, which is indigenous to India. The plant grows to a height of about 3-10 feet bearing fleshly pods 1½-4 inches long. Each pod contains 5-12 seeds. The plant comes into bearing in 3-3½ months and gives a very good yield. It is grown all over India. The green pods are commonly used as vegetable and the plant is used as a nutritious green fodder for horses and cattle and also as a green manure crop. The seeds are converted into *dhal*, cooked and fed to cattle with a little mustard oil. The seed is also utilised for the preparation of a gum which is used in food, paper and textile industries.

The gum-containing portion is separated from the outer coat of the seed through milling and the former is made into flour which is the commercial source of guar gum. The soluble part of *Guar flour* consists mainly of galactomannan, containing 34.5 per cent d-galactose anhydride and 63.4 per cent d-mannose anhydride. The flour is dispersible in hot or cold water yielding dispersions with exceptionally high viscosities at low concentrations and possessing 5-8 times the thickening power of ordinary starch. Aqueous dispersions of the gum are neutral in reaction and their viscosity is affected by changes in pH or electrolyte concentration.

Due to its colloidal nature, the gum acts as a stabiliser and thickener in food products like ice-cream, bakery mixes and salad dressings. Guar flour is also used in paper and textile industries.

Edible groundnut flour

E (IS) 79

Will you kindly inform me the approximate working capital required for the manufacture of edible groundnut flour on an experimental scale? What are the uses to which it can be put? (Pollachi).

The manufacture of edible groundnut flour can be started as an experimental measure with a working capital of about Rs 10,000 as stated by you.

It is difficult to give any exact idea of the percentage of profit that can be worked on this manufacturing line as several factors such as the procurement of raw material, the prices prevalent, labour charges, the consuming market etc., will count a great deal.

The flour is mostly used as a means to fortify wheat flour, tapioca flour and such other flours which go into the common dietary. Groundnut flour is a high protein rich food (containing about 50 per cent protein) and as such is an article of great nutritive value. It has also been recently used in the manufacture of Nutro Biscuits.

Quick cooking oats

E (IS) 80

I shall be highly obliged if you will furnish us with the details of manufacturing quick cooking oats. (Bombay).

The details of the method of manufacturing 'Quick cooking oats' are given below:

The oats are cleaned thoroughly to remove extraneous matter by passing through separators. The moisture content of the cleaned oats is reduced from about 10 per cent to about 6 per cent in order to increase the brittleness of the hulls and thereby facilitate their removal during hulling. This is done by drying or roasting the oats in a vertical stack of large steel pans. During the drying, oats are maintained at about 180°F for about one hour. This slow roasting or drying also helps to develop a desirable flavour in the groats. The dried oats are graded into lots according to size by passing through graders. The graded oats are passed into hulling stones or impact hullers wherein the hulls are removed and the groats are released. The mixture of unhulled oats, hulls, whole and broken groats and flour is passed through a horizontal sifting reel to remove oat flour and then through a succession of air separators to take out the hulls. The remaining mixture of unhulled oats and groats is graded to remove broken groats and then passed through a series of apron machines. Apron machines are provided with pockets of the correct size to receive the groats and carry them over the top of the machine while the hulled oats slide off the apron at the bottom.

The groats are steel-cut by means of rotary-type cutters, into pieces of desired sizes. After cutting, the groats are steamed directly with live steam at atmospheric pressure. The treatment sterilizes and cooks the particles yielding quick-cooking oats. This can also be made into flakes by feeding the steamed groats between two large steel rolls, the space between them being adjusted to produce thin flakes. The steamed groats and rolled flakes can be packed in tin containers. You may contact some of the leading engineering firms dealing in food plants for the necessary equipment.

Canning of tomato juice

E (IS) 81

We propose to set up a small scale plant for processing tomato juice and shall therefore feel highly obliged if you please let us have all the available information on the canning of tomato juice, along with addresses of indigenous manufacture of machinery for the purpose. (Kota, Rajasthan).

The following steps are involved in the manufacture of tomato juice. (1) Selection of good quality ripe tomatoes free from spoilage. (2) Thorough washing of the tomatoes with clean water. If the tomatoes are not very clean, it is necessary to wash them at last twice. (3) Removal of the central core with a stainless steel knife. (4) Cutting the tomatoes into halves or quarters depending upon the size. (5) Heating the tomatoes to a boil in stainless steel steam-jacketed pans or kettle. (6) Passing the heated tomatoes through a pulper or finisher to remove skins and seeds. If the operation is done on small scale, the material could be filtered through a coarse cloth. (7) Adjustment of the total solid content of the juice by addition of a small amount of sugar, if desired. Generally, the total solids content of tomatoes is around 5-6 per cent. This can be determined by the use of an appropriate Brix hydrometer or preferably a small hand refractometer. (8) The juice thus prepared is filled hot in sanitary tin containers of desired size and the containers are hermetically sealed and pasteurized in boiling water. The time for pasteurization will depend on the size of containers. If small containers of 1 lb. are filled at a temperature of about 185°F under hygienic conditions, it is not necessary to pasteurize them but just to invert the tins after filling and sealing and leave them to cool at room temperature. Pasteurisation time for 2 lb. containers when filled hot is between 10-15 minutes in boiling water.

The addresses of the machinery and equipment suppliers are as follows:

(*i*) Messrs Gardners Corporation, Connaught Circus, New Delhi.

(*ii*) Messrs Metal Box Company of India, Ltd., Barlow House Chowringhee, Calcutta;

and for scientific equipment such as hydrometers and refractometers.

(*iii*) Messrs Toshniwal Brothers Ltd., 198, Jamshedji Tata Road, Bombay-1.

Dehydration of bananas

E (IS) 82

What are the details of the method of dehydrating ripe bananas? (Cochin).

Select firm, ripe fruits free from blemishes and bruises of any kind. Wash the fruit thoroughly to get rid of the extraneous matter. Peel the fruit suitably to remove all the inedible matter adhering to the skin. Halve the fruit length-wise or cut into slices cross-wise. Immerse the cut fruit for about 15 minutes in 1 per cent solution of sodium carbonate and fill it up by carefully rinsing the fruit in clean fresh water. Spread the fruit on wooden flat bottom trays with the cut surfaces upwards.

Keep these trays in a fumigation chamber (sulphur box) wherein the cut fruit is exposed to the fumes of SO_2 obtained by burning sulphur at the rate of 8 lb. per ton of the fruit for every 1000 c. ft. of the chamber volume. According to the experience gained in this direction, half an hour's exposure yields a final dried product with about 500 p.p.m. of SO_2 which keeps the product alright during storage. Remove these trays and put them in the drier (home type) avoiding the contact of the fruit with iron as far as possible. Maintain a temperature of 130-140° F when it will take about 15-20 hours to get a final product having a moisture content of 18-22 per cent. Pack the finished product in moisture proof paper and keep in friction top tins thereby avoiding direct access of moisture to the finished product.

Composition of turmeric

E (IS) 83

I wish to know whether turmeric has any germicidal action on tuberculosis bacilli. I request you to throw some light on this and also furnish me with the composition of the raw and cured turmeric tubers. (Amravati District).

There is no reference in the literature about the germicidal action of turmeric towards tuberculosis bacilli. Turmeric is, however, used in Indian systems of medicine as a stomachic tonic and blood purifier. Mixed with warm milk, it is said to be beneficial in common cold. The juice of fresh turmeric tubers is used as an anti-parasitic for many skin infections. Externally, it is applied to indolent ulcers and a paste made from the powdered tubers along with lime forms a remedy for inflammed joints Oil of turmeric distilled from the dried tubers has favourable antiseptic properties.

The chemical composition of turmeric as reported in the Health Bulletin No. 23 is as follows:

Moisture	...	13.1%
Protein	...	6.3%
Fat	...	5.1%
Mineral matter	...	3.5%
Fibre	...	2.6%
Carbohydrate	...	61.4%
Calcium	...	0.15%
Phosphorous	...	0.28%
Iron	...	18. 6 mg.%
Carolic value	...	349 per 100
Carotene (I. U. of Vit. A./100g.)	...	50
Nicotinic acid	...	2.3 mg.%
Vitamin C	...	0

There is practically no difference between the compositions of raw (kacchi) and the cured (pakki) turmeric tubers.

Clarification of apple juice

E (IS) 84

I am interested in obtaining clarified apple juice and I have found that the tannin-gelatin method has failed.

Will you kindly suggest an effective method for clarifying apple juice on commercial scale? (Bombay).

The tannin gelatin method is commonly followed by the industry for clarifying apple juice and it generally gives good clarified juice. We, therefore, suggest that you try the method once again carefully following every detail. An alternative procedure of clarifying fruit juices is by the use of enzymes which hydrolyse colloidally suspended materials, particularly pectic substances, into either more or less soluble substances. A number of commercial enzyme-preparations consisting of mixtures of several types of enzymes possessing proteolytic, amylolytic and pectolytic properties are available for this purpose. Of these, Pectinol and Filtragol are most frequently used. These enzyme-preparations are obtained from various molds such as *Aspergillus oryzae*, *Aspergillus niger*, *Pencillium glaucum*, etc. After clarification of the fruit juices with the aid of either chemical agents or enzymes, the juice has to be filtered by passing through filter press using filter aids such as diatomaceous earth to get a clear juice. You may refer for details to the book 'Apples and Apple Products' by R. M. Smock and A. M. Neubert, published by Inter Science Publishers Inc., New York, 1950.

Tender field beans

E (IS) 85

Could you kindly enlighten me on the work that you have done on the anti-diabetic property of tender field beans? (Hunsur).

We have made some preliminary observations to the effect that when tender field beans (Avarekalu) are consumed daily along with the diet, there is a reduction in the blood sugar level of diabetic patients. This effect is not, however, observed in the case of mature seeds of field bean. We have also incidentally observed that use of blackgram dhal in the form of *Idli* or use of casein in the form of skim milk powder along with the diet produces a similar reduction in the blood sugar level of diabetes.

We have not prepared any product from tender field beans. We can, however, suggest that you could use plenty of the tender field beans available during the season.

Notes and News

STATISTICAL NOTES

Food Production Statistics for April 1958

Name of Industry	No. of units	Production during April 1958
Confectionery	30	690 tons
Biscuits	28	1,112 ,,
Flour milling	41	58,000 ,,
Butter (tinned)	7	126 ,,
Cashewnuts	10	1,500 ,,
Dal and gram flour	1	321 ,,
Aerated water	35	93,824 gross bottles
Beer	2	1,28,392 bulk gallons
Country spirit	25	4,77,399 L. P. gallons
Indian-made foreign liquor	15	45,132 bulk gallons

(*Ministry of Commerce and Industry, Government of India, New Delhi*)

NEWS BRIEFS

Baking strength of yeast: Compressed yeast loses its baking strength after it is harvested and formed into pound prints. Rapidity of this loss depends on the strain, method of growth, time of harvesting, solids content, temperature, and type of package.

When hourly samples were taken from normal 12-hr. yeast fermentations beginning with the 7th hr., best baking quality was shown in the the initial sample. Poorest quality sample was taken after 15 hr. (included 3 extra hours of ripening under aeration).

The 7th hour yeast lost baking strength much more rapidly, however, while the 15th hour sample was quite stable for a week. Keeping quality (resistance to softening at 98° F.) increased steadily from the 7th to the 15th hr., and was a reflection of the decrease in budding cells.

Percentage of dry substance reached a maximum 11 hr. after start of fermentation. Temperature rise in pound prints stored at 87° F. is almost linear with solids content, and is greater in prints wrapped in waxed paper than when parchment paper is used (*Food Engng.*, May 1958, p. 124).

New emulsifier ups quality of soft-serve ice cream: Developed especially for frozen dairy products, this liquid mono- and diglyceride emulsifier offers user convenience, blandness, and the extreme dryness required in novelties and soft-serve ice cream.

Product (Atmos 300) is used at a level of 0.1 per cent in extruded products, and is applicable to bulk ice cream at 0.06 per cent. Emulsifier can be added (*Food Engng.*, May 1958, p. 155.)

Freezing and cold storage of bakery products: After baking, all bakery products are subject to more or less pronounced staling phenomena which are reflected in changes of taste, compactness, etc. These phenomena are mainly due to changes in the moisture content, and can be largely avoided by freezing and cold storage, which has the effect of stabilising the moisture distribution and delaying moisture loss. For the process to be successful, the bakery products should be chilled to -7° C. within a comparatively short time of baking (1-1½ hr. for pastry, 3-4 hr. for bread and cake), and should subsequently be deep-frozen to -18° C. A further shortening of the time elapsing before chilling and freezing has no noticeable effect on quality. Defrosting may take place in the oven, in conditioned warm air, or at ambient temperature (*Food Manuf.*, May 1958, p. 209).

Free amino acids in meat products: In connection with studies on the chemistry of meat curing, research workers at the German Federal Meat Research Institute at Kulmbach have investigated the distribution of nitrogen and amino-acids were analysed paper-chromatographically. In investigations on the influence of brine curing on small pieces of meat, no significant difference was found between the free amino-acids contents of raw meat and those of cured meat. This is believed to be due to the fact that the loss of amino-acids dissolved by the brine is continuously made good by decomposition processes. The concentration of free amino-acids in the same meat product is lowest during the curing process just before maturing, the concentration being higher both in the raw meat and in the finished product (*Food Manuf.*, May 1958, p. 209).

German research report: The German Federal Research Institute for Food Preservation, Karlsruhe, has carried out systematic experimental research on the influence of freezing and storage conditions in German locker plants on the quality of foodstuffs, including pork, vegetables (cauliflower, beans, peas, cucumber, tomatoes) and fruits (strawberries, raspberries, red currants, peaches).

The quality testing included subjective evaluation as well as physical and chemical tests. It was found that most products may be frozen in stagnant air at -18° C. and stored in small units of approx. 1 kg. weight, without any marked loss in quality, for periods varying between five months (pork, cucumber) and twelve months (peas). The experiments indicated that the best way to preserve the quality of pork is to freeze it in an air stream or in contact with cold plates (*Food Manuf.*, May 1958, p. 209).

Preventing decay in whale meat: An increase in the yield of a whale of up to 25 per cent—through use of a preservative that delays deterioration—is announced in Britain. The technique is to inject oxytetracycline and citric acid into the carcase of the whale. Delay of onset of decay is said to be delayed by this treatment up to 36 hours.

The whale meat is preserved and does not turn rancid as does the untreated carcase, so that it may be left floating much longer without rancidity. Rancidity spoils the oil for top-grade classification, so that it cannot be used for margarine. The treatment is simple and cheap (*Food Industr. S. Africa*, July 1958 p. 24).

Fortification of milled rice: In order to improve the nutritional value of a basic food, the U.S. Food and Drug Administration has set a standard for the enrichment of milled rice. The standard insists on certain minimum amounts of thiamine, riboflavin, niacin and iron in the product. Under the standard rice may be enriched either by impregnation or coating, but each pound of milled rice must contain 2.0 mg. thiamine, 1.2 to 2.4 mg. riboflavin, 16 to 32 mg. niacin and 13 to 26 mg. iron. The rice may contain in addition 250 to 1,000 U.S.P. units of vitamin D and 500 to 1,000 mg. calcium. The cost of enrichment works out to about 25 nP. per 100 lb. of rice (*Indian Food Packer*, June 1958, p. 18).

Orange concentrate: Oranges can now be turned into a concentrate that produces a non-curdling drink when mixed with sweet milk. In the process, clean whole oranges are passed through a screw type long-barreled squeezing machine. The juice flows through exit holes while the pulp is forced through small holes in the end plate. 25 per cent sugar is added to the extract. One part of the frozen concentrate has to be added to four parts of milk (*Indian Food Packer*, June 1958, p. 15).

Dried milk tablets: Some foods, including milk, are available in form of compressed solid tablets. There is little doubt that in many instances this form is superior to powder from which the tablets are made and studies on this subject are of interest.

Detailed investigations of various factors which affect the quality of milk tablets (23-27 per cent sugar) and of tablets made from mixtures of dried milk with sugar and coffee or cocoa extracts were recently carried out in Poland (Chuchlowa). The mixtures contained 22-27 per cent sugar and 6-8 per cent of coffee or 13 per cent cocoa; the remainder was dried milk. The pressure used to compress the powder ranged from 10 to 1,012 atmospheres and was applied for 10-120 sec. either continuously or with intermediate relaxations; the tablets were in the form of cylinders 2.6-7.0 cm. in diameter and 18-54 mm. high. With normal commercial dried milk containing less than 3 per cent moisture, the best results were obtained when a pressure of 150-180 atmospheres was applied for 15 sec., relieved and re-applied again for 5 sec. The resultant tablets had a porosity of about 40 per cent, their volume was smaller than that of the powder by about 30 per cent, and they were crushed by a pressure of 32-44 kg./sq. cm. using the Hoeppler consistometer. When the tablets were pressed at pressures exceeding 200 atmospheres the tablets became too hard and too compact, were difficult to crush, and finally free fat appeared on their surface. For mixtures of dried milk with sugar and coffee or cocoa, the optimum pressure was 100-120 atmospheres. It is concluded from the results that tablets 4-7 cm. in diameter, weighing 30-36 g. and giving about 0.25 litre beverage when reconstituted, are most suitable for commercial production (*Indian Dairyman*, August 1958, p. 199).

Restoration of fresh flavour in processed foods: A method by which fresh flavour might be restored to canned, frozen and dehydrated foods, either by packing flavour-restoring enzymes with them or selling such enzymes separately like seasoning, is under investigation in the U.S. The experiments carried out so far are reported to be 'most encouraging'.

The basis for the technique lies in the fact that much of the characteristic flavour of fresh food depends upon 'flavour precursors', which are converted into actual flavour by chemical action stimulated by the enzymes.

Although enzymes are inactivated during processing, most commonly as the result of blanching, causing the typical fresh food flavour to be lost, experiments seem to indicate that the flavour precursors themselves survive the processing, and represent a source of latent flavour in the finished product. The experiments also indicate that the conversion of the latent flavour can be accomplished by addition of proper enzymes, termed 'flavour enzymes', which can be obtained from fresh food, or from biologically related material.

In one experiment recently carried out fresh watercress was blanched and dehydrated. It had none of the usual taste and smell of watercress when water was added. Upon the addition of a tasteless odourless enzyme preparation from white mustard seed—a related plant—however, the typical fresh taste and odour were restored within a few minutes. The same preparation produced a similar effect with dehydrated cabbage (*Food Trade Rev.*, May 1958, p. 16).

NEW INDIAN STANDARDS

Metric measures: Two Indian Standards on commercial metric measures cover (1) capacity measures, and (2) dispensing measures.

The Indian Standard Specification for Commercial Metric Capacity Measures (IS: 1058-1957) deals with measures having a capacity from 20 ml. to 20 litres. Specifications for measures of higher capacities for the use of wholesale dealers will be issued later.

Two shapes (*i*) cylindrical (20 ml. to 2 litres), and (*ii*) conical (100 ml. to 20 litres) have been prescribed. Cylindrical measures, which have been further subdivided into two types—dipping and pouring—are generally used for the sale of commodities like milk; conical measures are meant for use in the sale of mineral oils.

Dimensions, materials and tolerances of the different series of measures have been specified in the standard. Schematic diagrams have also been included to assist the manufacturers.

Special care has been taken to specify quite distinctive shapes for the measures so that confusion with the present shapes and sizes may be avoided during the transition period.

The Indian Standard Specification for Metric Dispensing Measure (IS:1160-1957) prescribes requirements for two types of measures made of glass and transparent plastic materials used for dispensing purposes. The two types are (*a*) conical measures with denominations 200 ml., 100 ml., 50 ml., 10 ml. and 5 ml.; and (*b*) beaker measures with denominations 1000 ml. and 500 ml. The specification prescribes types, dimensions, materials, shape, construction and graduation of the measures. It also gives the highest and the lowest graduation marks and permissible errors in capacity (*ISI Bull.*, May 1958, p. 140).

Hard boiled sugar confectionery: Hard boiled sugar confectionery falls within the general category of confectionery which is a processed food made of a mixture of various food products, the chief of which is a sweet substance, with or without added colour or flavour, and containing filling or other incidental materials. Hard boiled sugar confectionery is a supercooled solution of a combination of sucrose (cane sugar) and liquid glucose or sucrose alone treated with an acid doctor, such as cream of tartar, and the product thus obtained made into any desired shape or size.

Indian Standard Specification for hard boiled sugar confectionery (IS:1008-1957) covers two types of the material, namely, plain and modified, defined as follows:

Plain hard boiled sugar confectionery: Clear or pulled to incorporate air to cause opaqueness and shine, or composition adjusted so as to grain in a desired length of time.

Modified hard boiled sugar confectionary: A candy jacket of plain type containing a centre filling of fruit or fruit products or edible fat or milk products or cocoa products or nut products or other wholesome ingredients.

Physical and chemical requirements have been specified for both the types of materials. Care has been taken in particular to limit the metallic impurities, some of which are toxic. Methods for testing conformity with the requirements as also the method of packing and marking have been specified. In order to ensure that the sample taken for test is truly representative of the consignment, a method of sampling has been included in the standard (ISI: *Bull.*, May 1958, p. 141).

Condensed milk: Condensed milk, sweetened and unsweetened, is produced by evaporation *in vacuo* of milk, either whole or skim, with or without the addition of sucrose in the form of refined sugar. The removal of water in this way leads to the possibility of the storage of the resulting product unchanged for an appreciable length of time, thereby helping to ease the difficulties of co-ordinating the supply and demand. Condensed milk, (sweetened) is preserved by its high sucrose content, but the unsweetened material is preserved by sterilization.

An Indian Standard Specification for Condensed Milk IS: 1166-1957 prescribing requirements and methods of test for condensed milk has been issued by the Indian Standards Institution recently. The standard covers requirements for condensed milk, quality of reagents, packing and marking; and methods and procedures for the sampling of condensed milk; and for the determination of fat and total milk solid, fat, sucrose, bacterial count, titrable acidity, as also tests for coliform organisms, protein in the following four types of condensed milk:

(*a*) Condensed milk, full-cream, sweetened;

(*b*) Condensed milk, full-cream, unsweetened; commonly known as 'evaporated milk';

(*c*) Condensed milk, skim, sweetened; and

(*d*) Condensed milk, skim, unsweetened.

(*ISI Press Note* No. 194, 1958).

PATENTS

Indian

(A few of the Patent Applications notified as accepted in Part III, Section 2 of the Gazette of India from 1st March to 5th April 1958 are listed below):

59,356: *Process for the preparation of L-lysine:* Fermenting nutrient medium initially containing from 0.1 to 0.5 g. of L-lysine per litre, with a mutant of *E. coli* which initially requires L-lysine for growth.—Patented by Chas. Pfizer and Co., Inc.

61,739: *Antibiotic compositions and preparation thereof:* Penicillin is contacted with oleandomycin in a suitable medium.—Patented by Chas. Pfizer and Co., Inc.

58,827: *Process for producing crystalline novobiocin:* Treating concentrated solution of novobiocin-active material with alkanoic acid in aqueous alcoholic medium and recovering crystalline novobiocin.—Patented by Merk and Co., Inc.

58,276: *Sweetening compositions including tablets and solutions and method of preparing such compositions:* Comprising a mixture of salt of cyclamate and 9 per cent to 50 per cent of salt of saccharin.—Patented by Abbot Laboratories.

59,265: *An improved method for the isolation of psoralenisopsoralen from dried fruits of psoralea corylifolia:* Wherein the preliminary extraction of seeds to remove resinous material is carried out with petroleum ether at room temperature.—Patented by Council of Scientific and Industrial Research.

58,376: *Improvements in refining vegetable oils:* Treating with water in presence of acid anhydride of lower alkyl aliphatic monobasic and dibasic acids.—Patented by Staley Manufacturing Co.

61,157: *An improved process for the reclamation of oil and bleaching-clay from the filter-press-mud from the vanaspati and allied oil industries:* Extracting waste filter mud from vanaspati factories or oil industries with an organic solvent.—Shri Ram Institute for Industrial Research.

57,658: *Improvements in or relating to insecticidal coating compositions:* Cashewnut shell oil in admixture with contact insecticides.—Patented by Ramanujam and Ajmani.

Foreign

2,824,008: *Salt substitute for dieters* (U.S.): Potassium chloride, dipotassium succinate, and dipotassium fumarate comprise the ingredients of a patented salt substitute useful as a dietary supplement for persons requiring a sodium-free diet.

The mixture meets requirements of a substitute for common table salt in that it resembles salt in taste, appearance, physical properties, stability, and non-toxicity.

The following formula is illustrative of the invention: Potassium chloride 100 g., dipotassium fumarate 30 g., and dipotassium succinate 70 g. Ingredients are ground to 42 mesh and thoroughly mixed, then 0.2 g. sugar is added. The product is salt-like in taste, non-hygroscopic, and readily soluble in water (*Food Engng.*, May 1958, p. 119).

2,821,828: *Fruit-sorting machine* (U.S.): Novel improvements in a conventional fruit-sorting machine are disclosed in a recent patent.

They comprise: (*a*) Use of sponge rubber in appropriate places to prevent damage to fruit: (*b*) catch funnels that deliver it to crates, and (*c*) platforms suspended by springs that hold the crates up near the catch funnels. These springs allow the platforms to lower automatically as the crates become filled with fruit.

Fruit enters the machine through an intake chute and falls into individual baskets carried by an endless conveyor chain. Sorting is by weight, the heaviest fruit being tipped into a catch funnel nearest the the intake chute. Progressively lighter pieces are dropped into funnels farther from the intake, depending on adjustment of jockey weights. Catch-funnel walls, and rollers that deliver fruit to crates are covered with sponge rubber (*Food Engng.*, May 1958, p. 120).

2,823,124: *Ready-miscible chocolate* (U.S.): Extraction of chocolate essence from cocoa by a non-thermal process is the subject of a recent patent.

The operation consists in stirring an aqueous slurry of cocoa and $Ca(OH)_2$ until desired extraction is accomplished. After filtrate is allowed to ripen. Then any dissolved $Ca(OH)_2$ is removed, pH is adjusted, and solution is clarified by final filtration.

As an example, 8-10 lb. of cocoa are slurried with sufficient warm water to make 4½ gal. To this is added an aqueous suspension of $Ca(OH)_2$, equal to about 5 per cent of weight of cocoa. Mixture is then vigorously stirred for 3-5 hr. in a closed receptacle preferably in an atmosphere of nitrogen under slight pressure.

This is followed by filtration in a press under about 200 lb. pressure and in absence of air. Filtrate is freed from entrained Ca $(OH)_2$ by precipitation with phosphoric acid. Preferred pH of 6.65-6.9 is obtained by adding dilute acetic, citric, tartaric, or phosphoric acid.

On standing, the liquid takes on the colour and taste of chocolate. It may be bottled and sterilized as is, spray-dried, or converted into a syrup by the addition of sugar.

Advantages claimed for the product include ready miscibility with milk or carbonated drinks without settling out after long standing, and retention of flavour that might otherwise be lost in a thermal process (*Food Engng.*, May 1958, p. 124).

787,225: *Improved flour or dough:* A process is claimed in which a small quantity of ascorbic acid and/or reductic acid is added together with a small quantity of glucose-oxidase-containing preparation to flour or dough. The last-named compound is said to enhance the flour-improving properties of these acids very markedly. The quantity of ascorbic and/or reductic acid added to the flour is in the region of 0.2-2 gm. per 100 kg., while the quantity of the glucose-oxidase-containing preparation is in the amount of 5,000—10,000 glucose-oxidase units per g. of ascorbic acid and/or reductic acid.

An agent may be prepared which incorporates the ascorbic acid and/or reductic acid and the glucose-oxidase-containing preparations in the same proportions.—Patented by Koninklijke Industrieele Maatschappij Voorheen Noury and Van der Lande, N. V. (*Food Manuf.*, May 1958, p. 220).

790,972: *Improved sterile concentrated milk:* This invention comprises a method of preparing a concentrated milk in which whole milk is first sterilised by heating, approx. 6 sec. at 300°F. or for 5 min. at 250° F. The milk is then evaporated at a sub-atmospheric pressure. If the temperature of the milk falls below 120° F. at the end of this process it is heated to that temperature before it is homogenised. The milk may be reduced to approximately one-third of its original volume by this method.

The milk is afterwards filled into sterile air-tight containers. All the operations are carried out under aseptic conditions.—Patented by Continental Can. Co., Inc. (*Food Manuf.*, May 1958, p. 220).

790,969: *Steam cooking food:* A method designed to give rapid and uniform cooking, with minimum loss of flavour and nutritive value, is claimed. According to this invention, the food is cooked in a flowable condition by being first delivered to a flow of steam travelling through a closed chamber at a velocity sufficient to entrain the food and to keep it in suspension. A pressure is chosen to heat the food in the time that it is kept within the enclosed environment. Accordingly, the steam exists as a continuous phase and the food particles are kept in suspension as a discontinuous phase by reason of the pressure of the steam. Each particle is separately enveloped in the continuous atmosphere of the steam.

On leaving this environment the articles discharge into a separator, where temperature is rapidly lost as the steam expands.

Equipment is provided for carrying out the invention.—Patented by H. J. Heinz Co. (*Food Manuf.*, May 1958, p. 220).

790,812: *Preparing fish products:* In this invention a process is claimed for preparing a compact, coherent fish product. The surface of individual pieces of fish flesh is softened by treatment for a short time with an aqueous solution which has an alkaline reaction of at least pH 8. The solution contains an alkali metal hydroxide and/or an alkali metal salt. The pieces are then assembled in a juxtaposed position in contact with one another and held in that position at a temperature not exceeding 10°C. until the pieces of flesh adhere to each other. The pieces are afterwards frozen.

In one example of the process the pieces of fish are immersed for a period of 5-10 min. in a solution of 0.4 per cent NaOH plus 0.6 per cent Na_3PO_4 at room temperature, and are then packed in freezing moulds and deep-frozen.—Patented by H. Barez (*Food Manuf.*, May 1958 p. 220).

791,861: *Bread:* Relates to a process for the production of an enzyme-active bread improver for incorporating into a bread dough, which comprises comminuting raw soya beans or other raw leguminous seeds, producing a non-liquid mixture from the comminuted product by mixing therewith certain specified salts (*e.g.* alkali metal, ammonium, and alkaline earth metal halogen, acid salts and sulphates) either in the dry state or in the form of an aqueous concentrated solution or slurry and heating the mixture to an elevated temperature which is insufficient to impair its enzyme content.—Patented by British Soya Products, Ltd. (*Food Trade Rev.*, May 1958, p. 50).

791,810: *Frozen meat:* In the preparation of large quantities of meat for canning, the meat is placed in containers for deep freezing to seal-in the valuable juices and preserve it against deterioration since if it is allowed to thaw out before being cut up for further processing, the meat juices are lost and the meat loses weight: the object is to provide a machine which operates to cut or dice hard frozen meat into cubes quickly and effectively and without substantial wear of the machine.—Patented by Norman and Eldred Ltd., and Another (*Food Trade Rev.*, May 1958, p. 50).

791,193: *Dedhydrated potato:* Relates to the production of a dehydrated potato which will readily reconstitute to give a product having an improved texture characterised by a high degree of mealiness: potatoes are precooked at a temperature within the range 140-180°F., then cooked and mashed to give a solids content not less than 20 per cent; water added to reduce the solids content to a level not less than 18 per cent and the mash dehydrated in the form of a unicellular film (i.e. a single layer of potato starch cells) on a heated drum.—Patented by M. J. Willard (*Food Trade Rev.*, May 1958, p. 50).

792,651: *Fish processing:* Relates to a process of treating a headed, gutted and finned fish, to remove the skin, and to the subsequent freeing of fish flesh from the skeleton: the fish is heated by steam at a temperature in the range of 200°-225°F. for 10-45 secs. and conveyed head end first against a high pressure fluid stream impinging on the side of the fish at an angle of 30°-50° to the longitudinal axis, to roll back the skin—the fish is cooked to loosen the flesh from the skeleton, jarred to detach the flesh which is then separated from the skeleton by screening.—Patented by Birds Eye (Holdings), Ltd. (*Food Trade Rev.*, May 1958, p. 50).

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

Improvement of quality of preserved Coorg orange juice, by Lal, G., Siddappa, G. S. and Bhatia, B. S., *Indian J. Hort.*, 1957, **14** (2), 1.—The addition of a small amount of SO_2 to the juice prior to pasteurization does not improve the quality of the juice. The addition of a small amount of spice mixture, however, together with about 5 per cent sugar, is highly useful in improving the quality of preserved Coorg orange juice. Blending the juice with about a third of its weight of pineapple juice, and then adding 2-3 per cent sugar to the blend has a similar beneficial effect. Both types of juices are highly acceptable to consumers. The retention of ascorbic acid in the preserved juice is not adversely affected by these modifications of the juice. There is, therefore, scope for developing this type of modified orange juice.

Production of active dry Baker's Yeast, by Lewis, Y. S., Dwarakanath, C. T. and Johar, D. S., *J. sci. industr. Res.*, 1958, **17 A** (3), 146.—Active dry baker's yeast has been prepared by growing a strain of *Saccharomyces cerevisiae* Hansen var. *ellipso ideus* in a culture medium of the following composition: molasses, 4; ammonium sulphate (or urea), 0.1; and potassium dihydrogen phosphate, 0.1 per cent. The crop of yeast obtained after 24 hr. of growth was centrifuged and then dried in a current of cool air to a moisture content of 8.0-10.5 per cent. In trehalose content (10-12 per cent) and viability ($3.5\text{-}4\times10^{10}$ cells/g.), the product compares favourably with imported material and has shelf-life of 6-7 months.

Further studies in the preparation and uses of mango cereal flakes, by Jain, N. L., Girdhari Lal and Krishnamurthy, G. V., *Indian J. Hort.*, 1957, **14** (3), 1.—The process of manufacture of mango cereal flakes has been simplified considerably and the capital investment required for its commercial production reduced appreciably through the standardization of conditions for the use of raw wheat flour (*Atta*) and by replacement of a vacuum double drum drier with an atmospheric double drum drier. Further, drum drying under atmospheric conditions can be adopted as a continuous process while drying under vacuum can be undertaken only as a batch operation. The cost of production in case of the former is, therefore, further reduced through increased output. The former is also easier to control and thus permits production of a better quality product in respect of its physical characteristics, through proper check.

Mango Cereal flakes, which are rich in carotene and have attractive orange yellow colour, possess also a pleasant flavour truly characteristic of the mango fruit. They have been found highly acceptable to all tastes for use in a number of ways and appear to offer great possibilities for commercial development as they are expected to find a good market both at home and abroad. Process outlines of the method finally standardized for the preparation of mango cereal flakes as developed by the authors in this Institute are given in a flowsheet.

Studies on the storage of vegetable oils in colourless and deep-green bottles, by Prasad, M. and Mathur, P. B., *Proc. Fourth Symposium on Oils, Fats and Allied Products*, Oil Merchants' Chamber, Ltd., Bombay, 1955, p. 75.—A number of vegetable oils, *viz.*, groundnut oil (crude), groundnut oil (refined), sesame oil (crude), mustard oil (crude), coconut oil (crude), castor oil (refined), olive oil (crude) and vanaspati were stored in colourless and deep-green glass bottles with a head space of 1½ inches for two years at a temperature range of 70-91° F. (Mysore room temperature). As a result of estimations of peroxide values and acidity, it has been concluded that deep-green bottles are better than colourless glass bottles for the storage and marketing of above-mentioned vegetable oils.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Amino acid make-up of *Sterculia urens* seed globulin, by Narayanamurthi, D., *et al.*, *J. sci. indust. Res.*, 1958, **17 C** (6), 105.—The seed kernel of *Sterculia urens* are eaten by tribal people and is also used for the manufacture of plywood adhesives. The authors have, therefore, studied the nature and composition of the seed protein. The protein is made up of a glutanin an albumin and a globulin, the first two being present only in small amounts. The amino acid composition of the globulin fraction had been determined by circular paper chromatography. The method of preparation of globulin from the seed is given. The fraction is hydrolysed with acid, neutralised and the neutralised hydrolysate was analysed chromatographically. The following amino acids were found: cystine, lysine, histidine, arginine, asparagine, aspartic acid, glycine, serine, glutamic acid, threonine, alanine, tyrosine, phenylalanine, valine, leucine and isoleucine. Tryptophane, which is destroyed during hydrolysis was identified in the alkali hydrolysate colorimetrically. Poline was also found to be present in the hydrolysate of the total protein.

K.L.R.

The effect of rice and wheat diets on growth, reproduction and lactation in albino rats, by Dikshit, P. K. and Ranganathan, S., *Indian J. med. Res.*, 1958, **46** (3), 496.—It is generally believed that rice diet is conducive to better fertility as observed from the high density of population in rice eating areas. There is, however, no experimental evidence to prove such a relation. Several factors other than diet may be involved in the issue. The authors have, therefore carried out rat feeding trials under rigidly controlled conditions with a view to assessing the effect of the staple cereal diet on the fertility rate. One group of albino rats was fed a diet in which rice was the cereal and another identical group was fed a diet containing an equal amount of wheat, the other dietary constituents being the same. Growth rate, breeding and lactation performance of the rats on the two diets were recorded for three successive generations. Rats fed the rice diet showed greater growth than that observed with wheat diet. The constant 'K' of the slope of growth curve on the two diets for both males and females was higher than that reported by earlier workers. Reproduction and lactation performance of rats on rice diet was found to be lower than that on wheat diet. The rats of the two groups were comparable in other respects. Serum protein and bone ash of rats fed rice diet were slightly higher. The differences were, however, not statistically significant.

K.L.R.

Nutritive value of duck egg white. Part V. Some properties and composition of ovomucoids of duck egg and hen egg white, by Narasinga Rao, B. S. and Patwardhan, V. N., *Indian J. med. Res.*, 1958, **46** (3), 502.—The amino acid and carbohydrate composition of duck egg white and hen egg white ovomucoids have been qualitatively determined using paper chromatography.

A quantitative estimation of sugars and some amino acids with reactive groups revealed that DEW ovomucoid contains less mannose, glucosamine, guanidino groups and amide nitrogen, and more acid groups, phenolic-OH groups and methionine than HEW ovomucoid. The contents of amino, disulphide and imidazole groups are similar. Tryptophan is present in traces and galactose is absent from both the ovomucoids.

DEW and HEW ovomucoids have molecular weights of 38,570 and 37,000; optical rotation $(\alpha)^{21}_{D}$ of -70°.9 and- 57°.9; isoelectric points of pH 4.23 and pH 4.63; isoionic points of pH 4.18 and pH 3.43 respectively. Viscosity studies did not reveal any marked difference between the two proteins.

HEW ovomucoid was found to be much less stable to heat at different pH than DEW ovomucoid.

The differences in the physiological activities of the two ovomucoids are discussed in the light of the above findings.

Tropical megaloblastic anaemia in South India, by Baker, S. J. *Indian J. Pathol. Bacteriol.*, 1958, **1** (1), 11.—Sixty cases of megaloblastic anaemia in South Indians have been investigated with the aid of modern haematological techniques, including serum vitamin B_{12} assays and radioactive vitamin B_{12} absorption studies.

Fifty six cases were found to be due to B_{12} deficiency, one case to be a combined B_{12} and folic acid deficiency and three cases to folic deficiency.

In all cases of vitamin B_{12} deficiency, with the possible excepti of one, the reason for the B_{12} shown to be a small intestinal les interfering with absorption and u influenced by intrinsic factor. cases also had the other evidences of small intestinal disorder such as steatorrhoea, flat glucose tolerance test, and radiological abnormalities.

No cases of pernicious anaemia were discovered in this series, although fifteen patients had histamine fast achlorhydria.

The significance of these findings are discussed.

Nutritional factors in the pathogenesis of hepatic cirrhosis. Part I. Spontaneous reversibility of experimental hepatic fibrosis of dietary origin, by Sriramachari, S., *Indian J. Pathol. Bacteriol.*, 1958, **1** (1), 27.—The evolution and subsequent course of diffuse hepatic fibrosis was studied in 96 young weanling rats fed a low-protein, no-choline, high fat diet.

An initial fatty infiltration of the liver was followed by parenchymal destruction and fibrous tissue proliferation which ultimately resulted in a picture of diffuse hepatic fibrosis by about 3 months. This fibrosis instead of being permanent and progressive, gradually disappeared in subsequent months.

The spontaneous reversal of diffuse hepatic fibrosis is probably related to the severe degree of protein deficiency. Rehabilitation to a high-protein diet after the establishment of chronic liver injury actually resulted in an enhanced fibrous tissue reaction.

The possible clinical significance of these findings has been discussed.

Nutritional factors in the pathogenesis of hepatic cirrhosis. Part II. The effect of low protein diet on the mesenchymal response in CCl_4 induced cirrhosis, by Sriramachari, S., *Indian J. Pathol. Bacteriol.*, 1958, **1** (1), 35.—The effect of a low protein diet on the mesenchymal response of CCl_4 induced cirrhosis of the liver was investigated in 4 consecutive experiments comprising 158 young rats.

In spite of repeated parenchymal damage, the livers of the animals on the low protein diet consistently failed to show significant mesenchymal changes leading to cirrhosis, whereas many of the animals on the high-protein diet revealed cirrhotic changes.

The dietary protein level seems to play a dual role with regard to the parenchymal and mesenchymal changes involved in the pathogenesis of hepatic cirrhosis.

Severe protein deficiency promotes reversibility of cirrhosis probably by its inability to sustain a continuous turn over or proliferation of the connective tissue elements.

Studies on the mechanism of blood coagulation by proteolytic enzymes. Part I. Effect of calcium on the clotting and proteolytic activities of papain and trypsin, by Chatterjee, G. and Sarkar, N. K., *Ann. Biochem. exptl. Med.*, 1957, **17** (6), 179.—Decalcified trypsin (Amberlite treated) can coagulate decalcified rabbit plasma in absence of calcium, though its presence greatly increases the clotting activity of trypsin.

Decalcified papain cannot at all coagulate decalcified rabbit plasma without addition of calcium ion.

Calcium ion has no effect so far the proteolysis of decalcified plasma by decalcified papain or decalcified trypsin is concerned.

Studies on the mechanism of blood coagulation by proteolytic enzymes. Part II. Optimum pH for the proteolytic and clotting activities of papain and trypsin, by Chatterjee, G. and Sarkar, N. K., *Ann. Biochem. exptl. Med.*, 1957, **17** (6), 183.—Decalcified trypsin and decalcified papain can coagulate decalcified plasma optimally at pH 6.1 and 6.3 respectively. The pH optima for the proteolysis of decalcified plasma by decalcified trypsin and by decalcified papain are correspondingly 8.04 and 5.6.

The pH optima for the clotting and for the proteolysis by either papain or trypsin are different.

FRUIT AND VEGETABLE PRODUCTS

Carotene content of ***Roccella montagnei*****,** by Krishna Murthy, T. and Sankara Subrahmanian, S., *J. sci. industr. Res.*, 1958, **17 C** (6), 105.—The lichen, *Roccella montabgnei*, is reported to be a good source of carotene comparable with other well known natural sources like the leaves of Moringa, carrots and red palm oil. This lichen is also rich in riboflavin. The authors have reported a simple, rapid and reliable method for the estimation of carotene in liches. The procedure is to powder the lichen, reflux it with petroleum ether-acetone mixture (7:3) for 15 minutes and filter. The residue is washed well with the solvent and the combined filtrate evaporated under vacuum. The residue is taken up in ether, dried over anhydrous sodium sulphate and chromatograped on alumica column. The column is eluted with petroleum ether containing 2 per cent acetone and an aliquot of the eluate containing carotene is diluted with ether. This is used in estimating carotene in a Lovibond tintometer and a spectrophotometer at 450 mu. The amount of carotene is calculated from the calibration curve. The average carotene content is found to be 1.5-2.0 mg/g. of the air-dry lichen.

K.L.R.

Nutritive value of canned vegetables: Part II—Effect of storage, by Sawant, P. L. and Magar, N. G., *J. sci. industr. Res.*, 1958, **17 C** (8), 134.—The effect of storing at different temperatures, on the mineral, vitamin C and carotene contents of canned vegetables, *viz.*, bitter gourd (*Momordica charantia*), okra (*Abelmochus esculentus*), parwal (*Trichosanthes dioica*) and tondale (*Coccinia cordifolia*), has been investigated. Maximum losses were observed in the case of vitamin C and retention of the vitamin was maximum in *tondale;* a major part of the losses occurred in the first 4-8 months. Carotene was the most stable of all the nutrients, the retention values being 80-90 per cent at the end of 12 months' storage. The destruction of vitamin C seems to be catalysed by the iron dissolved out from the cans.

INSECTICIDES

Indigenous insecticides: Part II—Insecticidal properties of the seed oil of ***Annona squamosa*** **Linn.,** by Cheema, P. S., *et al.*, *J. sci. industr. Res.*, 1958, **17 C** (8), 132.—The seed oil of *Annona squamosa* Linn. has been tested for its insecticidal activity against the adults of housefly (*Musca nebulo* Linn.), larvae and adult mosquitoes, *Culex fatigans* (Wied.), adults of flour beetle (*Tribolium castaneum* Herbst.), larvae of woolly bear (*Anthrenus flavipes* Lec.) and larvae of case-bearing clothes moth (*Tinea pellionella* Linn.). The toxicity of the oil against these insects is poor as compared to pyrethrins and DDT.

MICROBIOLOGY

Biosynthesis of riboflavin in *Eremothecium ashbyii*, by Radhakrishna Murthy, R. and Sharma, P. S., *J. sci. industr. Res.*, 1958, **17 C** (8), 125.—The effects of vitamins in various combinations, sugars, antivitamins, amino acids and purines on the growth and flavinogenesis in *Eremothecium ashbyii*, have been studied. L-cysteine and L-cystine have been found to inhibit both growth and flavinogenesis.

The antivitamins, γ-hexachlorocyclohexane and sulphanilamide, inhibit riboflavin production in the medium irrespective of amino acid supplementation. No inhibition was, however, observed in the presence of xanthine or guanine indicating that the respective vitamins, inositol and probably p-aminobenzoic acid or pteroylglutamic acid, are concerned in the formation of rings B and C of riboflavin.

Ethanol tolerance of some yeasts, by Ranganathan, B. and Bhat, J. V., *J. Indian Inst. Sci.*, 1958, **40** (3), 105.—By suitable tests ethanol tolerance of twenty-eight strains of yeasts representing seven general and several species has been determined. In the light of the results recorded, the strains have been classified into three groups, *viz.*, poor ethanol tolerant yeasts, moderately ethanol tolerant yeasts and high ethanol tolerant yeasts.

Variations in protein and amino-acid contents between smooth and rough forms of certain serotypes of *Escherichia coli*, and their relation to DNA contents, by Banerjea, A., *Ann. Biochem exptl. Med.*, 1958, **17** (6), 199.—Smooth and rough variants of four serotypes of *E. coli*, O11B4, O11B5 and O26B6 and O86B7, considered to be pathogenic in the production of infantile diarrhoea, were investigated for their protein, amino-acid and DNA contents.

The protein content was found to diminish appreciably (5 to 12 per cent) in all the strains during S-R variation, except in case of O26B6 where it showed slight relative increase in the R form.

The DNA content diminished in the R forms of all the strains, except in case of O26B6 where it remained stationary.

Lysine, histidine, valine and phenylalanine were found to diminish in the R forms, whereas aspartic acid increased during S-R variations. Arginine decreased in all R forms except in O55B5 and tyrosine in all except O26B6. Other changes in amino-acid contents and the difference between the surface structures of *E. coli* and Gram-positive cocci are discussed.

OILS AND FATS

The refining and bleaching of vegetable oils, by Anon., *Res. and Ind.*, 1958, **3** (7), 180.—Refining is the most important process to which vegetable oils are subjected before conversion to finished products. If the oil is not properly refined, subsequent steps, such as bleaching, hydrogenation, winterizing and deodorization will not proceed smoothly and the final product will not be up to the mark.

In recent years a number of improved refining and bleaching processes have been developed. Some of them are already in use while others are being worked out on a pilot scale. A review of developments is presented in this article.

GENERAL

Lactic acid from Mowrah flowers, by Sutaria, P. B. and Magar, N. G., *J. sci. industr. Res.*, 1958, **17 C** (8), 136.—Alkali degradation or fermentation of carbohydrate materials are known to yield lactic acid. The production of lactic acid from Mowrah flowers (*Bassia latifolia*) which are a rich source of saccharine material has been reported in this note. The flowers are autoclaved with different alkalies at 15 lb./sq. inch (121°C) for varying periods of time. After digestion, the pH of the digest is adjusted to 2.0 with sulphuric acid. Total sugar and lactic acid are estimated before and after digestion. It is found that the yield of lactic acid is maximum when mixtures containing sugar and alkali in the molar ratio of 1:1 are autoclaved for 8 hours. The percentage of sugar conversion and lactic acid (g/100 g. sugar) formation under these conditions with different alkalies are: Ca $(OH)_2$—83.4, 44.29; LiOH—91.22, 50.31; NaOH—93.65, 52.22; and KOH—89.89, 47.71. Autoclaving for 24 hours yields 48.59, 55.05, 56.0 and 55.79 g. of lactic acid per 100 g. sugar respectively for the different alkalies. Besides lactic acid saccharinic and dihydroxy butyric acids have been chromatographically [illegible] in the alkali digest. The production of lactic acid has also been studied by fermenting a 10 per cent aqueous extract of the flowers with *Lactobacillus delbrueckii* and *L. bulgaricus*. The yield of lactic acid obtained by fermenting the flower extracts containing 8.99-12.15 g sugar/100 g. extract with the two organisms varies from 35.09 to 42.05 g/100 g. of sugar. Best yields of 42.05 with *L. delbrueckii* and 41.97 with *L. bulgaricus* are obtained by maintaining the sugar concentration at about 0.9 g/100 g. extract. The yield is found to be lower at higher concentrations.

K.L.R.

Chelating agents in industry, by Ramaiah, N. A. and Jolly, S. C. *Res. and Ind.*, 1958, **3** (5), 118.—Chelating agents are finding increasing use in analytical procedure in a number of industries. The article presents a survey of the applications of chelating agents in food, textile, paper, rubber, soap, leather and sugar industries. In the sugar industry, in particular, chelating agents have a promising field of application: *e.g.*, estimation of calcium in sugar-house products; cleaning evaporator tubes; and improving sugar recovery from cane juice.

Cellulose ion-exchange resins for purification and fractionation of proteins. Part II. Preparation and characterisation of carboxymethyl cellulose from indigenous raw materials, by Basu, D. K. and Choudhury, P. K., *J. Indian Chem. Soc.*, 1958, **35** (3), 173.—Carboxymethyl cellulose has been prepared from indigenous cellulosic raw materials and its efficiency has been tested qualitatively by column chromatography. Blotting paper and sulphite pulp appear to be satisfactory in this respect.

PART III (Foreign)

ANALYTICAL

Analysis of dried plant material by X-ray emission spectrograph, by Brandt, C. S. and Lazar, V. A., *J. agric. Fd. Chem.*, 1958, **6** (4), 306.—A method is described for determining the concentration of a number of elements in dried, ground plant material using an X-ray emission spectrograph. The concentration of a given element is determined by using the ratio of radiation intensity of that element to the radiation intensity of scatter. Working curves are developed using plant material which has been analyzed chemically. The technique seems to correct for most of the day-to-day variations to which such an instrument is subject. However, a consistent programme of daily reference standards is necessary for the satisfactory continuous operation of the instrument.

Apparatus for determination of the wiley melting point, by Marmour, R. A. and Ferm, R. L., *J. Amer. Oil Chem. Soc.*, 1958, **35** (3), 109.—A mechanically stirred Wiley Melting Point bath apparatus is described, which makes the Wiley Melting Point more accurate and reproducible, permits more determinations to be run at one time, and is less time-consuming than the hand-agitation procedure of the A.O.C.S. Method.

Spectrophotometric determination of protein in alkaline solution, by Hewitt, B. R., *Nature*, 1958, **182,** 246.—*Chlorella*-cell protein does not dissolve easily in acid solution. It is, therefore, dissolved in alkaline solution and the protein is estimated spectrophotometrically. The algae suspension is centrifuged and the cells are washed. Sodium hydroxide solution is added to the cells and kept in a boiling water bath for 10 minutes. The sodium hydroxide extract is diluted with water and alkaline copper solution is added to it. The contents are allowed to stand for 10 minutes and then a diluted solution of Folin-Ciocalten reagent is added. After 40 minutes, the extinction of the solution at 750 mμ is measured with a Zeiss spectrophotometer (Type PMQ II). A control blank experiment with the reagents is run and the protein values are read from a calibration curve previously drawn with μg. protein per molcule suspension of algae against extinction co-efficient at 750 mμ. The method is accurate within a marginal error of 5 per cent.

K.L.R.

Spectrophotometric determination of total carbohydrate, by Hewitt, B. R., *Nature*, 1948, **182,** 246.—The amount of carbohydrate in plant material has been estimated spectrophotometrically using the colour reaction with anthrone reagent. Algal suspension is diluted five times with water and to 1 ml. of this suspension, 10 ml. of anthrone reagent (consisting of 0.2 g. anthrone, 8 ml. absolute alcohol, 30 ml. water and 100 ml. concentrated sulphuric acid is added. The mixture is placed in a boiling water bath for 7 minutes and then cooled immediately. The extinction of the coloured solution is measured at 620 mu. The amount of total carbohydrate is directly read off in terms of μg. of glucose per ml. suspension from the calibration curve. A blank experiment with only the plant material and sulphuric acid was conducted in order to correct for the presence of plant pigments. A ratio of at least 10:1 between the anthrone reagent and suspension is necessary to get a straight-line relationship. The method involves an error of less than 8 per cent.

K.L.R.

BIOCHEMISTRY AND NUTRITION

The fortification of bread with lysine. IV. The nutritive value of lysine-supplemented bread in reproduction and lactation studies with rats, by Culik R. and Rosenberg, H. R., *Food Technol.*, 1958, **12** (4), 169.—The nutritive value of a diet based on white bread containing 6 per cent non-fat dry milk was compared with that of a diet based on a similar bread but baked from flour supplemented with 0.25 per cent L-lysine-HCl. The comparison was carried out with groups of rats maintained on the two diets, from weaning until death and which were bred until fertility ceased. The first litter of the parent generation on each diet was raised to maturity and then mated. In similar manner the comparison was carried through 5 successive generations. Lysine-supplementation of the bread improved reproduction and lactation performance considerably and uniformly throughout the 7 litters of the parent generation and all successive generations. Although this performance was similar to that of animals maintained on stock ration, the breeding performance of the animals maintained on the commercial bread diet was poor and decidedly inferior to that of the animals maintained on the lysine-supplemented bread diet. Use of a flour supplemented with 0.25 per cent L-lysine-HCl produced a bread which when used as the sole source of dietary protein resulted in normal or near normal reproduction and lactation of rats.

Studies on corn proteins. II. Electrophoretic analysis of germ and endosperm extracts, by Mertz, E. T., Lloyd, N. E. and Bressani, R., *Cereal Chem.*, 1958, **35** (2), 146.—Electrophoretic patterns on an alkaline copper extract and of a sodium chloride extract of the corn germ from a sample of U.S. corn were similar in conformation. Fractionation of alkaline copper extracts of the endosperm from a U.S. and a Guatemalan sample of corn gave three fractions, an acid-soluble fraction, an alkali, alcohol-soluble fraction (zein), and an alkali-soluble, alcohol-insoluble fraction (glutelin). These three fractions accounted respectively for 23.4, 46.9 and 24.3 per cent of the endosperm nitrogen in the U.S. sample and 24.3, 44.7 and 12.0 per cent of the endosperm nitrogen in the Guatemalan sample. Each of the electrophoretic components of the alkaline copper extracts of the endosperm from the U.S. and Guatemalan corn samples could be identified as an electrophoretic component of one or more of the three fractions. Electrophoretic analysis of a saline extract of U.S. endorsperm revealed four major components having mobilities similar or identical to four components of the alkaline copper extract. With the exception of a starch component, each of the electrophoretic components of the acid-soluble fractions of the U.S. and Guatemalan endosperms had a mobility similar or identical to one of the components of the zein glutelin fraction. This suggests that either albumins and globulins partially coprecipitate with the alkali-soluble, acid-insoluble proteins, or that only proteins of the zein and glutelin types are found in corn endosperm.

Studies on corn proteins. III. The glutelins of corn, by Lloyd, N. E. and Mertz, E. T., *Cereal Chem.*, 1958, **35** (2), 156.—Buffered solutions of whole glutelin prepared from an alkaline copper extract of corn were separated by differential centrifugation into three fractions, a coarse fraction (one-third of the protein), an alpha-plus-beta fraction, and a gamma fraction. On the basis of sedimentation data it is estimated that the alpha-fraction proteins had molecular weights in excess of 1 million, the beta-fraction proteins 100,000 to 200,000, and the gamma fraction proteins 10,000 to 20,000. Both the whole glutelin and the gamma-fraction proteins had the same mobility and migrated under a single peak in the Tiselius electrophoresis cell. The whole glutelin and gamma-fraction protteins contained more aspartic acid, arginine, cystine, glycine, lysine, tryptophan, and valine, and less glutamic acid, isoleucine, leucine, proline, and serine than zein. Physical measurements showed that the gamma-fraction proteins were highly elongated molecules.

Further observations on the enzymatic reduction of tetrazolium salts by monoamines, by Lagnado, J. R. and Sourkes, T. L., *Canad. J. Biochem. Physiol.*, 1958, **36** (6), 587.—Studies on the role of purines as cofactors in the enzymatic reduction of tetrazolium salts by monoamines have led to the following results: (1) with whole rat liver extracts as the source of enzymes, serveral purines exhibit cofactor activity either as the free base or as the corresponding riboside and ribotide derivatives. (2) In contrast to this, mitochondrial material from rat liver is active only if adenylic acid or one of several ribotide derivatives containing an adenylyl or similar moiety is used as cofactor. (3) Mitochondrial material utilizes hypoxanthine as cofactor for the amine/tetrazolium system only in combination with the supernatant obtained by centrifugation of tissue homogenates at 20,000 g. The additional factor present in this supernatant portion is heat-labile and nondialyzable. The possibility that this additional factor is an enzyme or enzymes converting the free base to the ribotide is discussed.

Inhibition studies have revealed that the amine/tetrazolium enzyme system is sensitive to several metal-binding agents, but no direct evidence for the role of a metal in the enzymatic reaction could be obtained. It was also found that nicotinamide and adenine, neither of which exhibits cofactor activity, are potent inhibitors of the enzyme system studied.

DAIRY PRODUCTS

Effect of phospholipids and unsaponifiable matter on oxidative stability of milk fat, by Smith, L. M., Frankel, E. N., H W. and Jack, E. L., *J. Dairy Sci.*, 1958, **41** (4), 472.—Stability of milk fat samples prepared by different methods was measured by determining the length of the induction period at 80 + 0.5°C. Fat extracted from cream or buttermilk with a 2:3 ether-pentane mixture had greater stability than churned fat. This was attributed to synergism between phospholipids and other anti-oxidants or synergists extracted from membrane material and plasma, and was confirmed by the stabilizing effects of adding to churned fat different levels of phospholipids and/or unsaponifiable matter. Churned fat contained no phospholipids. Unsaponifiable matter (free of acids) alone, added to churned and extracted fats, increased fat stability. Among the known constituents of the unsaponifiable matter, beta-carotene acted as a prooxidant, and cholesterol had no significant effect. Alpha-tocopherol was the only unsaponifiable constituent tested that acted synergistically with phospholipids in stabilizing churned fat. However, differences in the amounts of tocopherol could not entirely account for the differences in stability among different extracted fats. Oxidative deterioration was detected organoleptically in churned fat before the end of the induction period and at peroxide values less than 1.00.

Chromatographic separation of some milk lipids, by Frankel, E. N., *et al.*, *J. Dairy Sci.*, 1958, **41** (4), 483.—Fats extracted from milk and from dried buttermilk by mixtures of ethyl ether and pentane were chromatographed on silicic acid columns. Butanol was used to split the lipoprotein complexes in the buttermilk. Each fat in pentane was applied to the column and eluted with successive portions of 1, 10, 25 and 50 per cent ethyl ether in pentane, with methanol, with acetone, and with water. Cholesterol and phospholipids were separate, but most of the tocopherols and carotenoids remained with the triglycerides. Unsaponifiable matter prepared from churned fat was applied in hexane to alumina and celite (2:1) and to magnesia and celite (1:1) columns. The material on the alumina-celite column was eluted successively with hexane, benzene, ethyl ether, and methanol. A fraction characterized as 70 per cent cholesterol by chemical analysis and infrared spectrophotometry was recovered from the benzene eluate. The magnesia-celite column yielded 95 per cent cholesterol in the benzene eluate. Carotenoids were separated by developing the column with hexane to obtain five clearly defined zones. These were rechromatographed to obtain homogeneity. Characteristic absorption curves and partition tests established the presence of beta-carotene, neo-beta-carotene, lutein (xanthophyll), and zeaxanthin in the eluted fractions.

A rapid method for determining the fat emulsion stability of homogenized fluid milk products, by Gibson, D. L. and Herreid, E. O., *J. Dairy Sci.*, 1958, **41** (4), 509.—The Babcock centrifuge and fat testing apparatus were used. The method follows: Add 1 ml. of Sudan III to a milk test bottle, then add 17.5 ml. of milk at 110° F and shake for 15 sec. Add two 10-ml. portions of distilled water at 110°F., shaking for 30 sec. after each addition. Then fill the bottle to between the 7 and 8 per cent marks with distilled water at 110° F., being careful not to shake. Balance bottle in a centrifuge heated to 110° F. using the outside trunnion cups, and spin for 10 min. Read directly from the centrifuge, the cream volume to the nearest 0.1 per cent. Each 0.1 per cent cream volume is about equal to 1.0 per cent difference in the USPHS Index. Sudan III made the cream volume more distinct. Ethyl alcohol carried the dye. With this method small differences can be detected in fat emulsion stability as affected by some processing procedures.

EGG

Methods for depleting glucose from egg albumen before drying by Ayres, J. C., *Food Technol.*, 1958, **12** (4), 186.—There is little reproduction of cells by *Saccharomyces cerevisiae* or *Streptococcus lactis* when these organisms are introduced into egg white. Unless large inocula are introduced or yeast extract is added to the cells before they are placed with egg white, there is a decrease in number during the first 24 hours. Numbers of cells of *Aerobacter aerogenes*, however, do increase in the egg white and, by adding yeast extract, their rate of growth is accelerated. Fermentation by *Saccharomyces cerevisiae*, *Streptococcus lactis* and *Aerobacter aerogenes* can be successfully completed in 4.5—5.5 hours by the incorporation of 0.1 per cent yeast extract. Also, the time needed for a *Streptococcus* 'resting cell' fermentation to reach a glucose-free stage is reduced from 3.5 to 2.5 hours by such addition.

With the use of yeast extract it is possible to eliminate the need for unnecessarily large inocula and, if the inoculation levels are wisely selected, only the number of cells necessary to remove the glucose need be introduced. The minimum inoculum procedure eliminated much of the yeasty or bready aroma in the *Saccharomyces* fermentation, the high acidity developed in the *Streptococcus* fermentation, and the growth of excessive numbers of cells and the formation of large amounts of acetyl methyl carbinol in the *Aerobacter* fermentation. Egg white freed of glucose by *Saccharomyces* or *Streptococcus* produced foams of lighter weight than did fresh albumen while enzyme-treated albumen was heavier than the control. All three fermented albumens produced cakes of satisfactory volume.

FISH

Ribonuclease activity of fish muscle extracts, by Tomlinson, N., *Canad. J. Biochem. Physiol.*, 1958, **36** (6), 533.—A ribonuclease was partially purified from muscle of lingcod (*Opthiodon elongalus*). The preparation degraded yeast and lingcod ribonucleic acid. Four 3'-mononucleotides were identified as digestion products. The enzyme was readily destroyed by heat and acid (10 minutes at 58° C., pH 2.5) and was inhibited strongly by Zn^{++} Cu^{++}, monoiodoacetate, formaldehyde, and NaF. Its pH optimum was 6.5. Ribonuclease activity was also demonstrated in muscle extracts from spring salmon, lemon sole, dogfish, sculpin, herring, and swordfish. The muscle extracts of all fish examined possessed phosphodiesterase activity. The ribonuclease in lingcod extract could be separated from twophosphodiesterases also present by zone electrophoresis.

B.V.S.

Analysis of the protein constituents of drip from thawed fish muscles, by Seagram, H. L., *Food Res.*, 1958, **23** (2), 143.—Employing the procedures of conventional fractionations and electrophoretic methods, the author has studied the protein constituents of drip as compared to the known major protein fraction of fish muscle, and has tried to detect any relative change in the ionic characteristics of proteins when the fish muscle is frozen. Experimental details regarding the preparation of drip and extracts, paper-electrophoretic analysis etc., are given. Seven components, divided into three mobility groups by paper-electrophoresis, were identified in the centrifuge drip got from the white muscle of yellow striped rockfish. It was also noticed that there was a definite similarity between the drip protein composition and extracts of low-ionic strength from fresh fish-muscle. In view of this and also as the contractible protein actomyosin was absent in drip, the author has suggested that the sacroplasmic protein fraction of fish muscle is not closely associated with the origin of drip.

B.V.S.

FRUIT AND VEGETABLE PRODUCTS

Bruising and the quality of freestone peaches, by Sterling, C., Chichester, C. O. and Hughes, Jr., R. E., *Food Technol.*, 1958, **12** (4), 196.—Sugar and acid relationships attendant on bruising were stuided, Increased sugar content (slight) combined with decreased acidity of bruised freestone peaches resulted in enhanced flavour. Further study is planned.

Effect of storage conditions on nutrients in frozen green beans, peas, orange juice and strawberries, by Derse, P. H. and Teply L. J., *J. agric. Fd. Chem.*, 1958, **6** (4), 309.—Frozen French-style green beans, green sweet peas, sliced strawberries, and orange juice concentrate were stored at 0°F. for 2, 5, and 11 months and exposed to 20°F. for 1 month at the end of these periods (variation samples). Control samples were held at 0°F. throughout these storage periods. Twenty-one nutrients were determined. In general, there was good retention of vitamins, except for ascorbic acid in all samples of green beans and in the variation samples of peas.

MEAT

Additives for meat products: A critical survey. I. Polyphosphates, by A. McM. Jaylor, *Food Manuf.* 1958, **33** (7), 286.—The author has examined critically the published work on the use of polyphosphates for improving the quality of meat products. The nature of the polyphosphates formed by the polymerisation of two or more molecules of simple orthophosphates the effect of polyphosphates on water-binding and the legal as well as health aspects are discussed. The advantages and the disadvantages of using polyphosphates, in the fields of ham curing, canned communuted meats and in sausages are also examined in detail. The author sums up the position regarding polyphosphates that 'they may make a good product better, but they cannot make bad product good. B.V.S.

MICROBIOLOGY

Effect of oxy-chlororaphin on the growth in vitro of streptomyces species and some pathogenic fungi, by Sierra, G. and Veringa, H. A., *Nature*, 1958, **182**, 265.—Oxychlororaphin is reported to possess fungistatic properties in suppressing the growth of several microorganisms. Gystalline oxychlororaphin has been prepared by dissolving chlororaphin in acetone. After cooling in contact with air, the solution yielded crystals of oxychlororaphin, which was purified by recrystallisation in acetone. The pure substrate was added into suitable agar media at different concentrations and the pH of the media was adjusted to 5.6-5.8. The activity tests were carried out by the usual method, *Streptomyces* cultures being incubated at 25°C and cultures of pothogenic fungi at 37°C. The concentrations of oxy-chlororaphin that are needed for the complete as well as partial inhibition of the growth of several species have been determined. Oxychlororaphin does not act as an antiseptic as shown by its non-interference with the respiration of the micro-organisms, but acts more as a fungistatic, having an antagonistic action by which growth is prevented.

K.L.R.

The elimination of pathogens from frozen whole egg-1, by Heler, C. L., Knowles, N. R. and Bryce Jones, K., *Food Manuf.*, 1958, **33** (6), 245.—The authors have discussed the bacteriology of frozen egg with reference to the possibility of its carrying the casuative organisms of paratyphoid fever —*Salm Paratyphi* B and other salmonellae. Details regarding pasteurisation method, the time and the temperature to eliminate salmonellac, as published by several workers in the field are given. Irradiation of eggs by cathode or gamma rays is also regarded as one of the successful methods, in future, if does not initiate new health risks. B.V.S.

The viability of ***Escheric coli*** **and a spoilage yeast carbonated beverages,** by Wi L. D., Berry, J. M. and Folinazz J. F., *Food Res.*, 1958, **23** (2), 13 The combined effects of sucr concentration, pH and degree carbonation on the viabilities *Escherichia coli* and a spoilage in soft drinks have been investi The test organisms were part strains isolated from a spo carbonated orange drink. T lethal condition for yeast most was in a solution with pH of 2 10° Brix and 4.5 volumes of carbo nation. *Escherichia coli* was fo to be markedly more sensitive t the changes of pH, degree Brix a carbonation than the test strain o yeast. Sucrose concentration di not govern the lethality of the yea while the variation in carbonatio with an increase in pH broug down the lethality significantly.

B.V.S.

OILS AND FATS

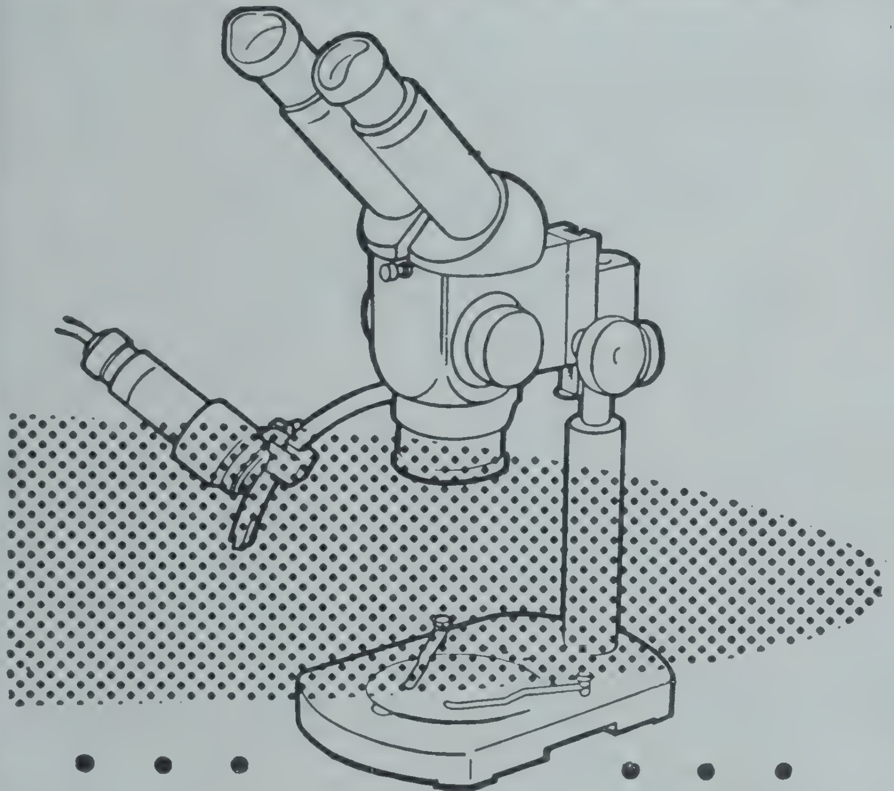
The effect of mono-enoic fatty-acid esters on the growth and fecal lipides of rats, by Murray, T. K. and Campbell, J. A. *J. Amer. Oil Chem. Soc.*, 1958, **35** (4), 156.—The growth rates of rats fed a purified diet containing 5 per cent corn oil or the methyl esters of oleic, eicosenoic, or erucic acid have been compared. At this level none of the esters significantly depressed the growth of male rats, but all three reduced the growth of females below that of those fed corn oil. Food efficiency and food consumption were not significantly reduced by any of the esters. Symptoms of essential fatty acid deficiency occurred only among rats fed the fatty acid esters and not among rats fed the fat-free diet.

Methyl erucate increased the excretion of true fatty acids, acidic material not soluble in hexane and unsaponifiable matter, as compared to methyl oleate. The true fatty acid excreted was largely eruc Methyl eicosenoate gave results not appreciably different from methyl oleate except for a slight incre in the excretion of mono-un saturated fatty acid from rats eicosenoate. Both corn oil and methyl erucate increased the excretion of unsaponifiable matter. The coefficient of digestibility of methyl eicosenoate and erucate were 96 per cent and 90 per cent respectively, which are higher values than have been previously reported.

Influence of heat on oxidative stability and on effectiveness of metal-inactivating agents in vegetable oils, by Cooney, P. H., *et al.*, *J. Amer. Oil Chem. Soc.*, 1958, 35 (4), 152.—Metal-inactivating agents, such as citric acid, sorbitol, lecithin, and carboxymethylmercapto succinic acid, are not active in unheated vegetable oils. Apparently trace metals present in normal glyceride oils are held within a complex of unknown structure. After heating an oil, the metals can be complexed by metal-inactivating agents, such as citric acid. The release of metals appears to be associated closely with the breakdown of the fatty acid hydroperoxides. Formation of some association or complex between the metal and the hydroperoxide group or between the metal and the unsaturated linkage of the fatty hydroperoxide is suggested. The metals are held very tenaciously within this unknown structure. Although the metal is not available as an uncomplexed metallic ion, it does behave as a very strong pro-oxidant catalyst. The application of heat releases the metal so it can be complexed by added metal inactivators.

GENERAL

Advances in vacuum dehydration in the United Kingdom, by Hauson, S. W. F., *Food Technol.*, 1958, 12 (4), 194.—The advances made were twofold: gains in the elucidation of fundamental changes that occur during dehydration and subsequent storage and a major 'break-through' in the development of freeze-drying.



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EFFECTIVENESS OF SOME CHEMICAL FOOD PRESERVATIVES IN CONTROLLING FUNGAL SPOILAGE IN MANGO SQUASH

By J. C. Anand, T. C. Soumithri and D. S. Johar

(*Central Food Technological Research Institute, Mysore.*)

Mango squash prepared from ripe mango pulp is a very popular drink in the country. It is sold in the market as a squash or after appropriate dilution as *ready-to-serve* type drinks under different trade names. In an earlier report[1], it was observed that fruit squashes are highly susceptible to spoilage by osmophilic fungi causing gaseous fermentation or mould growth on the surface of these products thereby making them unsightly and unpalatable. According to another report[2], about 12 per cent of the samples of mango squash did not conform to the prescribed standards in the year 1953-54 alone.

Different chemical food preservatives are used to prevent microbial spoilage in fruit juices and squashes all over the world. In India, according to the Fruit Products Order[3] only sulphurous and benzoic acids or their salts are permitted upto 0.035 and 0.06 per cent respectively for use in beverages. The combination of these preservatives is forbidden in this country eventhough such a combination may offer certain advantages by extending the scope of the mixture of preservatives for controlling a wide range of organisms. Also it is not clear why the same dosages of sulphurous and benzoic acids have been fixed irrespective of wide variations in the composition, nature and size of inherent contamination in these squashes.

Besides the above mentioned preservatives, other antifungal substances like propionic acid and its salts, sorbic acid and sodium sorbate as well as sodium diacetate are being widely used in bakery products and fruit juices. The efficacy of these substances in controlling spoilage in products like mango squash is not known. The principal aim of the present investigations was therefore to ascertain the specificity of the preservatives mentioned above so that among the large number of possible alternatives, the most efficacious ones may be selected and recommended for the benefit of the industry. Studies were also conducted to find out the effect of the combination of preservatives on the control of contaminating micro-organisms in mango squash.

FOOD SCIENCE **NOVEMBER 1958**

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Materials and Methods

Preparation of pulp: Equal weights of ripe mangoes of Raspuri and Badami varieties were taken. After peeling, their flesh was passed through 2 mm. mesh sieve in an electric pulper. The collected pulp was straightaway frozen at 13°F in stainless steel containers.

Preparation of squash: The squash was prepared from the thawed pulp according to a standard recipe by mixing 30 lbs. of pulp with 43.2 lbs. of water, 45 lbs. of cane sugar and 15 oz. of citric acid. This squash on analysis gave 44.5° Brix at 27°C; reducing sugars 3.8 per cent; total sugars 42.8 per cent, acidity as citric acid 0.93 per cent and pH 2.76.

Addition of preservatives: All the preservatives used belonged to B.P. standards. These included potassium metabisulphite, sodium benzoate, sorbic acid, sodium propionate and sodium diacetate. The sulphur dioxide content of potassium metabisulphite was estimated each time before use according to A.O. A.C. method for free H_2SO_3. Requisite proportions of these preservatives were invariably mixed with 1200 ml. of squash and the latter was equally distributed in four well cleaned and dried bottles of 14 oz. capacity. In the case of a mixture of preservatives, a part of either one of these preservatives was substituted with an appropriate amount of the second one so as not to increase the total toxic effect of the mixture as compared with either constituent when used alone.

Preparation and addition of inocula: An osmophilic true yeast and a strain of *Aspergillus niger* were isolated from a badly fermenting sample of mango squash and purified on acid-dextrose-agar for use as test organisms. Large crops of the above organisms were cultivated in Kolle's culture flasks on the above medium at 30° C. Yeast cells were harvested after 3 days and mould spores after 7 days by scraping the surface growth in sterile water with the aid of sterile glass beads. The suspensions were later passed through sterile cotton gauze piece to remove agar lumps and subsequently washed in a sterile glass with distilled water three times with the help of a centrifuge. The viability of yeast cells and mould spores in the respective suspensions in sterile water was found to be 80-85 per cent and 85-90 per cent respectively when compared with the total haemocytometer counts. These suspensions were subsequently diluted to give total counts of 10×10^6 cells/ml. and 10×10^3 spores/ml. of yeast and mould respectively. One ml. of either of these standard suspensions was added to each bottle containing 300 ml. of squash. Each lot of the inoculated bottles in duplicate were subsequently left, after corking, both at room temperature (25-27° C) and in the incubator at 33° C. Growth of yeast in the squash was confirmed by gas formation while the mould formed a mat at the surface finally giving dark coloured fruiting bodies.

Organoleptic evaluations on microbiologically sound samples of mango squash were also made after three fold dilution of the squash with water by a panel of ten judges.

Results

The results given in Table I are quite interesting. It is observed that when used within permissible limits these preservatives have a selectiv action towards the spoilage flora. In control lots there is evidence of gaseous fermentation due to yeast. Mould spores do not thrive under these environments. Among the preservatives sulphur dioxide, sodium propionate and sodium diacetate are relatively more effective in inhibiting growth of moulds than sodium benzoate or sorbic acid which are in turn more effective against yeast.

Further, whereas sulphur dioxide is quite effective in controlling spoilage in mango squash in the prescribed limits set forth by the Fruit Products Order, sodium benzoate is ineffective in controlling mould growth within the prescribed limits. This may be ascribed to the slightly high size of mould inoculum in the squash. It is, however, indicated that too much reliance on sodium benzoate in the presence of heavy initial contamination of mould spores can lead to mould spoilage. In combination with 175 or 300 p.p.m. respectively of sulphur dioxide even 500 and 200 p.p.m. of sodium benzoate are quite effective in controlling spoilage of either type. Similar benefits were not found to be derived by combining it with sorbic acid.

The data in Table I also indicate that sodium propionate and sodium diacetate are not effective in controlling yeast fermentation even at as high as 2000 and 1000 p.p.m. levels respectively. This is also borne out from the literature as these two preservatives are used exclusively for controlling mould growth and rope forming bacteria in bakery products. At 0.1 per cent concentration sorbic acid is more fungistatic than sodium benzoate and sodium propionate which carroborates the findings of Melnick et al[4]. The effect of varying temperatures on the growth of contaminants is not very pronounced. If the level of the preservative is not inhibitory, the yeast or mould will grow at either temperature i.e., 25-27°C or 33°C.

Organoleptic tests carried out with squash by a panel of judges reveal that sorbic acid, although it helps to keep the squash free from fungal growth yet it affects adversely the colour and taste of the product (*See Table*). The best treatment for

TABLE I. *Efficacy of chemical preservatives in controlling fungal spoilage in mango squash and organoleptic evalution of unspoiled samples after 12 months' storage*

Lot No.	TREATMENT	Yeast Fermentation		Mould Growth		Organoleptic evalution	
		25–27°C	33°C	25–27°C	33°C	Colour	Taste
I. A	Control (Uninoculated)	+	+	—	—	...	...
B	,, (Inoculated)	+	+	—	—	...	...
II. A	100 p.p.m. sulphur dioxide	+	+	—	—	...	...
B	200 ,, ,, ,,	+	+	—	—	...	...
C	350 ,, ,, ,,	—	—	—	—	Natural	Good
III. A	500 p.p.m. sodium benzoate	—	—	+	+	...	...
B	750 ,, ,, ,,	—	—	+	+	...	...
C	1,000 ,, ,, ,,	—	—	+	+	...	...
IV. A	500 p.p.m. sorbic acid	—	—	+	+	...	...
B	750 ,, ,, ,,	—	—	+	+	...	...
C	1,000 ,, ,, ,,	—	—	—	—	Slightly dark	Unacceptable
V. A	500 p.p.m. sodium propionate	+	+	—	—	...	...
B	1,000 ,, ,, ,,	+	+	—	—	...	...
C	2,000 ,, ,, ,,	+	+	—	—	...	...
VI. A	500 p.p.m. sodium diacetate	+	+	—	—	...	...
B	750 ,, ,, ,,	+	+	—	—	...	...
C	1,000 ,, ,, ,,	+	+	—	—	...	...
VII. A	200 p.p.m. sodium benzoate + 300 p.p.m. SO_2	—	—	—	—	Natural	Excellent
B	500 ,, ,, ,, + 175 ,, ,,	—	—	—	—	,,	Tolerable
C	750 ,, ,, ,, + 100 ,, ,,	—	—	+	+	...	...
VIII. A	250 p.p.m. sorbic acid + 300 p.p.m. SO_2	—	—	—	—	Natural	Slightly better than IIC
B	500 ,, ,, ,, + 200 ,, ,,	—	—	—	—	,,	,,
C	750 ,, ,, ,, + 100 ,, ,,	—	—	+	+	...	...
IX. A	200 ,, ,, ,, + 750 p.p.m. sodium benzoate	—	—	+	+	...	...
B	500 ,, ,, ,, + 500 ,, ,, ,,	—	—	+	+	...	...
C	750 ,, ,, ,, + 250 ,, ,, ,,	—	—	+	+	...	...

p.p.m. = parts per million parts; + = yeast and mould growth confirmed; — = no growth.

the overall preservation of the squash seems to be the use of a combination of two preservatives *viz.*, sodium benzoate and sulphur dioxide at 200 p.p.m. and 300 p.p.m. levels respectively. The next best is the use of sulphur dioxide in combination with sorbic acid. Earlier workers like Ferguson and Powrie[5] have already established that use of an antioxident like ascorbic acid with sorbic acid increases the shelf life of fresh apple juice from 4 to 14 days.

Thus it is evident that combination of sulphur dioxide with sodium benzoate or sorbic acid is more advantageous to retain the natural characteristics of mango squash. Such a combination further assures the keeping quality of this product by exerting its inhibitory influence over a wider range of contaminants *i.e.*, both yeasts and moulds.

Summary

1. Different fungicides, permissible for use in food products, have been screened for inhibiting the growth of Osmophilic yeast and *Aspergillus niger* in mango squash.

2. It is observed that sulphur dioxide, sodium propionate, sodium diacetate are more effective

against mould while sodium benzoate and sorbic acid are more effective against yeast.

3. Sodium propionate and sodium diacetate are not effective in the control of fungal spoilage in mango squash even at 2000 and 1000 p.p.m. levels respectively.

4. Sulphur dioxide at 350 p.p.m. level is efficient to control growth of yeast and mould whereas sodium benzoate is unable to inhibit mould growth at 1000 p.p.m. level.

5. The treatment using a combination of 300 p.p.m. sulphur dioxide with 200 p.p.m. sodium benzoate helped to retain best colour and taste. The combination of 300 and 200 p.p.m. levels of sulphur dioxide with 250 and 500 p.p.m. respectively of sorbic acid is slightly more beneficial for retaining better taste in the product than 35 p.p.m. sulphur dioxide when used alone.

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THE EFFECT OF PARTIAL OR COMPLETE REPLACEMENT OF RICE IN POOR VEGETARIAN DIET BY RAGI (ELEUSINE CORACANA) ON THE GROWTH AND COMPOSITION OF LIVER OF RATS

Rice which forms the staple food of a majority of the population in India and South East Asia, has been shown to be a poor source of calcium[1]. Aykroyd and Krishnan[1, 2] showed that poor vegetarian rice diets are deficient in calcium, certain vitamins of the B-complex and vitamin A. They found that among the different foodstuffs, skim milk powder and whole milk powder produced the maximum supplementary value, while pulses and green leafy vegetables were less effective. The same authors reported that addition of calcium lactate alone to the rice diet produced a striking improvement in the growth response of rats indicating thereby that calcium was one of the limiting deficiencies in the poor rice diets. It was, therefore, considered of interest to study the supplementary value of ragi (which is a rich source of calcium) to the rice diets.

The samples of ragi and raw milled rice used in the experiments were procured from the local market. The grains were cleaned of impurities and powdered to pass through 50 mesh sieve. The protein (Nx 6.25) content of the samples of rice and ragi were 7.01 per cent and 6.90 per cent and the calcium contents were 0.013 per cent and 0.344 per cent respectively.

The nutritive value of poor vegetarian diets containing different amounts of raw milled rice and ragi was studied by the rat growth method[3]. The composition of the experimental diets is given in Table I. Four groups of weanling rats weighing between 45 and 50 g. (16 in each group and distributed equally according to sex, lit and body weight) were used in the experime

TABLE I *Composition of experimental diets*

Diet No.	Percentage of rice and ragi in the diet*	Nitrogen content of diet on moisture free basis %	Calcium content of diet on mositure free basis mg/100
A.	Rice 78.5 ...	1.436	31.0
B.	Rice 58.9 Ragi 19.6 ...	1.407	109.0
C.	Rice 39.2 Ragi 39.3 ...	1.376	176.4
D.	Ragi 78.5 ...	1.315	305.1

* The other ingredients in all the diets were as follows: Red gram dhal *Cajanus indicus* 5.0; Non–leafy vegetables (potato and brinjal) 8.2; Leafy vegetables (*amaranthus gangeticus*) 2.1; groundnut oil 5.0; skim milk powder common salt 0.3.

TABLE II. *Average increage in body-weight of albino rats on poor vegetarian diets based on rice and/or ragi*

Diet No.	Average daily food intake on moisture free basis (g)		Average weekly gain in body wt. (g)			
	In 8 weeks	In 13 weeks	In 8 weeks		In 13 weeks	
A.	7.84	7.94	4.80±0.35	41 d.f.	4.06±0.26	41 d.f.
B.	9.59	10.08	9.66±0.33		7.98±0.25	
C.	9.74	12.26	10.40±0.33		8.74±0.25	
D.	10.05	10.53	10.37±0.33		8.74±0.25	

Tests of significance of gain in weight:

A∼B	Sig. at 0.1%	Sig. at 0.1%
A∼C	,, 0.1%	,, 0.1%
A∼D	,, 0.1%	,, 0.1%
B∼C	N.S.	,, 5%
B∼D	N.S.	,, 5%
C∼D	N.S.	N.S.

TABLE III. *Chemical composition af the liver of rats fed on poor vegetarian diets based on rice and/or ragi*
(Period of experiment: 13 weeks)

No. of diet	Percentage of rice and ragi in the diet	Average body weight		Average wt. of fresh liver		Composition of fresh livers					
		Initial (g)	Final (g)			Moisture %		Protein % (N×6.25)		Fat %	
A	Rice 78.5 ...	48.1	91.5	4.36±0.13	(42 d.f.)	71.38±0.31	(42 d.f.)	18.89±0.23	(42 d.f.)	4.50±0.12	(42 d.f.)
B	Rice 58.9 Ragi 19.6 ...	48.3	152.0	5.73±0.13		70.76±0.31		19.56±0.23		4.86±0.12	
C	Rice 39.2 Ragi 39.3 ...	48.1	161.7	5.70±0.13		70.86±0.31		19.18±0.23		5.06±0.12	
D	Ragi 78.5 ...	48.5	162.1	5.53±0.13		70.90±0.31		19.53±0.23		5.04±0.12	

Test of significance:				
A∼B	Sig. at 0.1%	N.S.	N.S.	Sig. at 5%
A∼C	,, 0.1%	N.S.	N.S.	,, 1%
A∼D	,, 0.1%	N.S.	N.S.	,, 1%
B∼C	N.S.	N.S.	N.S.	N.S.
B∼D	N.S.	N.S.	N.S.	N.S.
C∼D	N.S.	N.S.	N.S.	N.S.

Each group contained 16 rats (8 males and females).
* Other ingridients were the same in all the diets (see table I).

The methods adopted for the preparation of the diets and the feeding of the experimental animals were the same, as those described by Subrahmanyan *et al*[3]. At the end of 13 weeks, the animals were sacrificed and the livers removed and analysed for moisture, nitrogen and fat according to the methods described by Joseph *et al*[4]. The data regarding the average increase in weight during 8 weeks and 13 weeks are presented in Table II and the composition of liver in Table III.

The results on statistical analysis showed that replacement of rice to the extent of 25 or 50 per cent by ragi brought about a marked improvement in the growth promoting value of the rice diet. There was only a slight difference in the growth response of rats fed on diets containing 25 or 50 or 100 per cent of ragi. No significant difference was observed in the average protein content of the livers of the different groups of rats. The liver fat content of rats fed on diets containing 25 or 50 or 100 per cent of ragi was slightly higher than that of the livers of rats fed on the rice diet. The results obtained in the present study are of considerable practical importance as they indicate a simple and cheap means of making up the calcium deficiency in poor rice diets.

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METABOLISM OF NITROGEN, CALCIUM AND PHOSPHORUS IN CHILDREN ON A POOR VEGETARIAN DIET BASED ON RAGI (Eleusine coracana)

Ragi is the staple food in the diets of the poorer classes of people in Mysore state and Deccan plateau. It is unique among the cereal grains in being a very rich source of calcium[1]. Subrahmanyan *et al*[2] reported the results of human metabolism studies on adult human beings on a ragi diet. No metabolic studies have so far been reported with ragi diets on children. The present note gives the results of studies on the metabolism of nitrogen, calcium and phosphorus in children on a poor vegetarian ragi diet.

Eight healthy girls (age 9-10 years and weight 15.7—20 Kg.) who were residents of a boarding home in Mysore city were selected as experimental subjects. They were fed ragi diet which on a daily average basis included the following constituents: Ragi 280 g; red gram dhal (*Cajanus indicus*) 20g; groundnut oil 25 g; potato 20 g; brinjal (*Solanum melongena*) 10 g; Amaranth leaves (*Amaranthus gangeticus*) 10 g; radish 10 g; skimmed milk powder 5 g; cane sugar 25 g; tamarind pulp (*Tamarindus indicus*) 9 g; common salt 9 g; cocoanut kernel 3 g; condiments (garlic, coriander seeds, red chillies etc.,) 8 g. The diet was found to have the following composition Protein (N×6.25) 28.2 g; fat 31.2 g; carbohydrates 268 g; calcium 1.15 g; phosphorus 0.89 g and calorific value 1465. The experimental period lasted 15 days. The first 10 days of the experimental period was a preliminary one to allow the subjects to get accustomed to the diet and the equipment used. Urine and faeces were collected for analysis during the last 5 days. The diet and the excreta were preserved and analysed for total nitrogen, calcium and phosphorus according to the methods adopted by Murthy *et al*[3]. The results obtained for the metabolism of nitrogen, calcium and phosphorus are given in Table I.

All the subjects maintained positive nitrogen, calcium and phosphorus balances. The average excretion of the nitrogen in faeces was very high (2.111 g.) and the apparent digestibility of the protein from the diet was only 53 per cent. The average daily intake of calcium was 1151 mg. and the mean retention was only 226 mg. amounting to about 20 per cent of intake. A large part (about 77 per cent) of the ingested calcium was voided in the faeces. The average daily retention

TABLE I. *Average daily intake, excretion and balance of nitrogen and phosphorus in children on ragi diet*

Constituent	Intake	Amount excreted			Balance
		Urine	Faeces	Total	
Nitrogen (g)	4.510	1.879 ± 0.086	2.111 ± 0.082	3.990	0.520 ± 0.107
Calcium (mg)	1151.0	36.4 ± 6.2	888.8 ± 24.1	925.2	225.8 ± 19.7
Phosphorus (mg)	886.7	117.6 ± 5.0	633.9 ± 12.9	751.5	135.2 ± 13.1

of phosphorus on the ragi diet was 135.2 mg. (about 15 per cent of the intake).

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PREPARATION OF FRUIT TOFFEES

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Toffees of the familiar type are made mostly from starch, sugar, solid and/or liquid glucose, fat, milk powder and essences, etc. In our investigations on the economic utilization of various kinds of surplus fruits, a new use has been developed for the indigenous pulpy fruits like banana, mango, guava, jack, papaya, etc. This consists in the incorporation of these pulps in the preparation of hardened fruit confections with the texture of toffees. Such toffees in which fruit pulps have been incorporated are naturally highly nutritious as they contain most of the nutritive constituents of fruits from which they are made. At the same time they possess all the essential characteristics of non-fruit toffees (available to the consumer at present). The method of preparation of these fruit toffees was covered by the Indian Patent No. 50805, which has now been withdrawn. Since there is considerable interest in the recipes developed and the process standardized, the details are released in this note.

Method of preparation

Preparation of fruit pulp: Pulp of the fruit to be used is first made. A stainless steel pulper with 20—30 mesh and 50—60 mesh screens may be used on a small factory scale for this purpose in the case of fruits like bananas, mangoes, jack fruit, etc. For preparation on a cottage-scale, pulp may be prepared by crushing the peeled and prepared fruit and pressing it through a stainless steel or monel metal sieve. Before pulping, fruits like bananas may be steamed under atmospheric pressure for about 5 minutes to check enzymatic browning. On a small scale, as in the home, steaming may be replaced by sprinkling a 0.1 per cent solution of potassium metabisulphite over the fruit with satisfactory results.

2. *Recipe:* A general recipe is as under:

Fruit pulp	53 lbs.
Sugar	30 lbs.
Glucose	5 lbs.
Skim milk powder	8 lbs.
Hydrogenated fat (Vanaspati) ...	5 lbs.

A suitable essence and colour, if desired.

3. *Cooking:* The fruit pulp is concentrated by evaporation in a steam jacketed kettle to about a third of its original volume. The other ingredients, except the essence, are then mixed up and cooking continued to a temperature of 125°C, when the final weight of the product will be equal to about 1 1/5 times that of the fruit pulp taken, Milk powder may be added best in the form of a thick homogeneous aqueous paste.

4. *Cooling and setting:* The cooked mass is transferred to a smooth, hard and level surface such as a table with stainless steel top, smeared lightly with fat. The flavouring material is added at this stage, if desired, and the product spread into a thin sheet of 1/2 to 3/4 cm. thickness and allowed to cool and set for two hours. The solid sheet is cut into toffees in the usual way. These are then dried at 50-55°C to a final moisture content of about 5-6 per cent. After this, the toffees are wrapped as usual.

Equipment Required

I. *Home-scale preparation* (5 lb. batch)

		Approx. price Rs.
Monel metal or stailnless steel sieve, 8 to 10 mesh (8″ dia.) 59 to 80 mesh (8″ dia.) ...	One	50
Aluminium kettles 10 lbs. capacity	Two	10
Aluminium trays 2′ × 1′ ...	Two	15
Table knife (stainless steel) ...	One	2
Wooden roller ...	One	2
Stainless steel scraper ...	One	5
Stove (kerosene oil) ...	One	20
	Total Rs.	105

II. *Cottage-scale* (25 to 50 lbs. a day)

		Approx. price Rs.
Aluminium kettles (15 lbs.) ...	3	20
Stainless steel or monel metal sieves of 12″ dia; 8 to 10 mesh ...	1	70
50 to 60 mesh ...	1	
Stainless Steel cooking pan (15 lbs.) ...	1	35
Coal furnace	1	25
Aluminium trays (3′ × 1½′)	6	75
Table knives	2	5
Home drier with heating arrangement ...	1	200
Wooden rollers	1	2
Stainless steel scraper	1	7
	Total Rs.	440

III. *Small factory scale* (200 lbs. per day)

		Approx. price Rs.
Fruit preparation table (stainless steel top)	1	200
Steaming box, with stainless steel, perforated baskets and crates ...	1	500
Pulping machine (stainless steel with 20 to 30 and 50–60 mesh sieves) ...	1	4,500
Stainless steel steam jacketed pans of 10 gallon capacity	3	3,000
Kneading and cooling tables, with necessary frames, etc (stainless steel)	4	1,200
Mixer (screw type homogenizer ...	1	8,000
Home driers at Rs. 200/- each with heating arrangement	5	1,000
Aluminium drying trays	40	400
Toffee cutters, stainless steel ...	1	150
Wooden rollers	4	16
Wooden ladles for mixing	4	8
Stainless steel scrapers	3	50
Boiler (second hand)	1	6,000
Water, steam and electricity installation	—	3,000
Miscellaneous items like knives, laboratory glass ware, etc.	According to requirements	1,000
	Tatal Rs.	26,524 or say 26,500

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THE CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF SUNFLOWER SEED AND ITS PRODUCTS

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Sunflower (*Helianthus annus*) is cultivated mainly for its seed which is a rich source of oil and protein. The plant is believed to be indigenous to Mexico and was introduced into Europe in the 16th century and gradually became an important crop in Eastern Europe, more especially in Russia[1]. A remarkable development of recent years is the rise in the importance of sunflower as an oil seed crop in Argentina, where the cultivation is said to have begun by Russian immigrants. The world production of sunflower seed is given in Table I from which it is clear that both Russia and Argentina are the largest producers of the seed[1].

TABLE I. *World production of sunflower seed during, 1948*

Country	*Production of sunflower seed (1,000 short tons)*
Canada	11.6
United States	10.1
Hungary	389.3
Yugoslavia	133.4
U.S.S.R.	1,866.0
Turkey	88.2
Argentina	1,025.1
Chile	35.5
Uruguay	41.2
Union of South Africa	40.0
Total world*	4,073.0

* Includes estimates for all countries for which data are not given above.

Numerous varieties of sunflower are being cultivated in different countries. These can be divided into the tall or giant types which grow from about 8 to 14 feet, dwarf types which reach a height of 4 to 7 feet, as also types intermediate between these. As an oil seed crop the dwarf varieties are preferred because of their more uniform and shorter heights which makes mechanical harvesting comparatively easy and also because of these seeds having a larger weight per bushel and higher oil content than the white or gray seeds obtained from the giant type of sunflower varieties.

Chemical composition of the seed

Sunflower seed contains an outer epicarp which carries the pigment in most varieties, the mesocarp made up of innumerable layers of hard fibrous material and the endocarp which completes the main husk structure. The husk encloses the kernel which contains the embryo or germ. The seed is usually found to contain 50-55 per cent of hulls and 45-50 per cent of kernel. The chemical composition of the whole seed as well as of the kernel is given in Table II[2].

TABLE II. *Composition of sunflower seed and kernel*[2]

Constituent	*Whole seed*	*Kernels*
Hulls %	48.0	...
Kernels %	52.0	...
Moisture %	6.9	4.5
Fat %	24.7	41.5
Protein (N×6.25) % ...	16.1	27.7
Crude fibre %	17.9	1.0
Carbohydrates %	21.3	21.5
Ash %	3.1	3.8

Amino acid composition of sunflower protein

Osborne and Campbell[3] reported that the main constituent of sunflower protein is a globulin. The amino acid composition of the proteins of sunflower seed has been studied by several workers both by chemical and microbiological and paper chromatographic[4, 5] assay methods. The results indicate that sunflower seed proteins are good sources of many essential amino acids. The average values for the content of different amino acids as compared to those of other oil seed proteins is given in Table III[6].

It will be seen from the above table that sunflower seed proteins like sesame proteins are particularly rich in methionine in which other oil seed proteins are somewhat deficient.

TABLE III. *Amino acid composition of the sunflower seed protein as compared to the proteins of other oil-seeds and whole egg*[6]
(Amino acid (g) per 16 g. nitrogen)

Amino acid	Sunflower seed	Groundnut	Soyabean	Cottonseed	Sesame	Whole egg
Arginine	8.2	9.9	7.1	7.4	8.7	6.2
Histidine	1.7	2.1	2.3	2.6	1.5	2.1
Lysine	3.8	3.0	5.8	2.7	2.8	6.3
Tryptophan	1.3	1.0	1.2	1.3	1.8	1.1
Phenylalanine	5.0	5.4	5.7	6.8	8.0	5.7
Methionine	2.9	1.2	2.0	2.1	3.2	3.2
Threonine	3.9	1.5	4 0	3.0	4.0	4.9
Isoleucine	5.2	3.0	4.7	3.4	4.8	6.2
Valine	5.4	8.0	4.2	3.7	5.1	7.0

Nutritive value of sunflower seed proteins

Clagett *et al*[7] studied the biological value of sunflower seed protein by the nitrogen balance method and reported a value of 64.5. Ganchev and Popov[8] on the other hand reported a low figure (for the biological value of sunflower seed protein). This difference could be due to the fact that the oil free residue employed for these studies was obtained by pressure extraction methods involving severe heat treatment which was reported to reduce the biological value to a considerable extent. Bricker *et al*[9] studied the nitrogen balance in adult human beings fed on diets in which the protein was supplied only by sunflower seed meal. They reported a figure of 89.1 for the coefficient of digestibility and 64 for the biological value of sunflower seed protein. Grau and Almquist[10] observed that the growth promoting value of sunflower seed proteins for chicks to be very high being of the same order as that of animal proteins like casein, lactalbumin and meat proteins. Sunflower seed proteins being rich in methionine were found to supplement significantly those of groundnut[11] but not of soyabean[12]. Csaky[13] showed that sunflower seed proteins and maize proteins supplemented each other. Matet *et al*[14]. observed that sunflower seed proteins were superior to those of groundnut meal, soyabean, baker's yeast or blood meal in promoting growth in rats. Mitchell *et al*[15]. showed that sunflower seed proteins were sensitive to heat injury but when the meal was prepared by solvent extraction at low temperature, the proteins were found to be of fairly high biological value. Autoclaving of sunflower seeds depressed both the digestibility of the protein and its biological value with a lowering of 10.2 per cent in net utilization due to heat damage[15]. The digestibility of sunflower seed protein was found to be high[16] being similar to that of milk proteins[17].

Composition and nutritive value of sunflower seed meal

The sunflower seed meal obtained by expressing only the seed kernels is almost free from fibre and can be used for edible purposes. The chemical composition of the meal[18] obtained from the seed kernels as compared with certain other protein foods is given in Table IV. As is evident from the table sunflower seed meal is a rich source of certain minerals especially calcium and phosphorus. The meal can be satisfactorily blended with wheat flour and corn meal to make nutritions and appetizing baked foods[24, 25].

Sunflower seed meal is a good source of B-complex vitamins especially thiamine, niacin and riboflavin[26]. Day and Levin[25] studied the effect of feeding an adequate diet containing sunflower seed meal to rats as the only source of all B-complex vitamins. The growth as well as the appearance of the animals showed clearly that sunflower seed meal fed at low levels was slightly superior to wheat germ and corn germ meals at comparable levels as a source of all the B-complex vitamins. The above results indicated that sunflower seed meal might be of considerable practical value in nutrition, as a supplement to cereal diets. Clagett *et al*[7]. showed that riboflavin was present in sunflower meal in the bound form and was not available for growth of animals. Rector *et al*[27]. reported that sunflower seed meal was an excellent source of nicotinic acid and pantothenic acid and in this respect superior to soyabean meal, wheat germ and corn germ.

Sunflower seed meal in infant feeding

The use of sunflower seed meal in infant feeding was first described by Willemin Clog[28] and by Ribadeau-Dumas[29]. The meal was prepared from the decorticated and defatted seeds. When used by itself, infants grew well only for about 3 weeks, but for continuous weight gains, other supplements were necessary. A satisfactory mixture incorporating the meal had 10 parts cream of rice, 5 parts sugar, 2½ parts malt extract, 4 parts sunflower meal, 2 parts of sodium chloride and 4 parts of calcium carbonate. About 130 children aged from 10 weeks to 10 months were treated for cow's milk intolerance, eczema and dyspepsia by using the mixture in their diets. The resutls were highly satisfactory, the stools were bulky, variously coloured and had a characteristic smell. The utilization of nitrogen was reported to be high.

Extraction of oil from sunflower seed

To obtain a good quality oil as well as cake only the kernels from the sunflower seed should be

TABLE IV. *Chemical composition of sunflower seed meal as compared with certain protein rich foods*

Material	Moisture %	Protein (N × 6.25) %	Ether extractives %	Carbohydrates %	Crude fibre %	Ash %	Calcium %	Phosphorus %	Thiamine mg %	Nicotinic acid mg %	Riboflavin mg %
Sunflower seed meal[18] ...	7.8	37.0	10.6	35.9	1.2	7.5	0.36	0.60	1.50	31.2	0.47
Soyabean flour (low fat)[19] ...	5.0	50.0	7.0	31.0	2.5	5.5	0.33	0.62	0.70	5.7	0.30
Sesame flour (low fat)[20] ...	5.6	33.3	12.2	38.1	4.8	6.0	2.38	0.63	1.05	5.3	...
Cottonseed flour (alcohol extracted)[21] ...	9.2	52.1	5.5	25.8	1.5	5.9	0.36	0.82	0.99	...	...
Cocoanut flour (low fat)[20] ...	11.2	20.9	13.3	39.2	10.5	4.9	0.16	0.49	0.17	4.1	...
Groundnut flour (low fat)[22] ...	11.0	52.7	8.9	21.8	1.0	4.6	0.07	0.50	0.95	19.5	0.20
Skim milk powder[23] ...	4.1	35.0	1.0	51.0	...	6.8	1.30	1.03	0.35	1.1	1.39

expressed either in a screw or hydraulic press[1]. Decortication of the seed prior to extraction results in higher yields of the oil, as the hulls, if present, are found to reabsorb about 5 per cent of the extracted oil. The average yield of the oil by screw or hydraulic press is about 30 per cent on the weight of kernel[1].

Composition and nutritive value of sunflower seed oil

Sunflower seed oil like most other vegetable oils finds use for edible purposes, especially in Russia and South America. The oil is used as a cooking oil and also in the preparation of shortening, hydrogenated fat or oleo-margarine. The crude oil is usually refined by treatment with alkali and bleaching agents. The fatty acid composition of sunflower seed oil[30] as compared with that of safflower and niger seed oils is given in Table V. From these results it is clear that the composition of the oil is similar to that of safflower seed oil or niger seed oil. It contains essentially no linoleinic acid. Sunflower seed oil, in addition to its use for edible purposes, finds several industrial uses. It is a good lubricant and when polymerized does not gelatinize. It is used in making soaps, lubricants, varnishes, illuminants and for oiling wools.

TABLE V. *Fatty acid composition of sunflower seed oil as compared to similar edible oils*

Fatty acids	Sunflower seed oil	Safflower seed oil	Niger seed oil	Groundnut oil*
Myristic ...	...	1.2	3.3	...
Palmitic ...	3.5	3.9	8.4	8.3
Stearic ...	2·9	1.5	4.9	3.1
Arachidic ...	0.6	0.4	0.5	2.4
Lignoceric ...	0.4	0.06	...	1.1
Oleic ...	33.4	28.6	31.0	56.0
Linoleic ...	57.5	63.0	54.3	26.0

* Found to contain 3.1% of Behenic acid also.

Sunflower seed oil is being used for edible purposes and has been reported to be as nutritive as olive oil. Langworthy[31] and Holmes[32] have studied the digestibility of sunflower seed oil both in human beings and adult rats and have found the oil to be digested almost completely.

Conclusion

In view of the fact that protein malnutrition (*Kwashiorkor*) is widely prevalent among children belonging to the lower income groups of the population in several Asian countries, Africa and South America, attempts are being made in different countries to prepare concentrated protein foods from readily available vegetable sources to combat protein malnutrition[33]. But many of these protein foods suffer from the drawback that they lack in the essential amino acid *viz.*, Methionine. As sunflower seed proteins are rich in methionine, and contain adequate amount of other essential amino acids, it will be desirable to cultivate sunflower seed on a large scale for preparing an edible meal rich in proteins. The meal can be incorporated with other more abundantly available meals like groundnut, soyabean etc., so as to obtain a blend which can provide high quality protein rich in all essential amino acids.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during September, 1958 are given in this section.

S (IS) 24

Nutritive value of rice in relation to its degree of polishing, by G. Rama Rao (*September* 13, 1958)—After explaining the meaning of the term 'degree of polishing' and the method of its determination, the speaker pointed out that the polishing of rice leads to extensive loss of minerals and B-group vitamins and this was the reason as to why the intake of undermilled rice is recommended. For reasons of economy also, completely unpolished rice is often given in the rations of people. Against these apparent advantages, it is known that husked or undermilled rice has a poor keeping and cooking quality and contains large amounts of phytic acid which interferes with the utilization of dietary calcium. The latter aspect assumes significance since rice contains usually sub-marginal quantities of calcium.

Human metabolism studies were undertaken to arrive at an optimal degree of polishing for rice which would not deplete thiamine below a safe level (about 1.5—1.8 γ/g) and would not affect adversely mineral and nitrogen balances in human subjects. A local variety of rice (*Bangarsanna* Co. 11) shelled in a commercial sheller was polished in a cone polisher to remove 2.9, 4.1 and 6.3 per cent of bran. These three samples as also shelled rice in the same variety formed the cereal portion in the diet fed to the experimental subjects. The diet was vegetarian and similar to the 'Poor South Indian Diet' which has been adopted as typical of what the majority of rice eaters belonging to the low income groups in South India consume. It contained very little milk and for this reason was deficient in calcium.

The above rice diet was fed to the subjects for 12 days and excretions in the last five days of the feeding period were collected for analysis. The dietary regimen during the four consecutive periods was identical except for a change in the degree of polishing of the rice forming the main constituent of the diet. A week's rest period was allowed for the subjects between two metabolism periods. The balances of nitrogen, calcium and phosphorus during each feeding period were studied.

In spite of slightly higher intakes of nitrogen in the diet as a result of their higher protein content, husked and undermilled samples of rice did not produce greater nitrogen balances than the better polished samples. The results indicated a slightly higher nitrogen balance in the polished rice diet. Husked rice and 2.9 per cent polished rice produced a slightly negative average calcium balance (4 subjects out of seven on each of the diets had negative balances) while 4.1 per cent and 6.3 per cent polished rice induced small positive balances of the order of 36 and 77 mg. respectively. Positive phosphorus balances were recorded for all the subjects during each of the four dietary periods, although the under-polished samples did not produce higher balances as could be expected merely in the basis of their much higher phosphorus contents.

These results on calcium and phosphorus balances can be explained on the basis of the higher content of phytin-phosphorus in the samples with a low degree of polishing. The faecal bulk on the dry basis was much higher on the unpolished rice diet. Differences between 6.3 per cent, 4.1 per cent and 2.9 per cent polished rice were, however, small indicating that the type of fibre which increases the faecal bulk is removed much faster in the earlier stages of polishing.

The speaker said that husked rice and 2.9 per cent polished rice have poor culinary and storage qualities and also produced negative calcium balances when fed in the rice diet. 6.3 per cent polished rice is otherwise acceptable in every respect but its thiamine content is low (1.1 γ/g). 4.1 per cent polished rice can be considered a *via media* stage of polishing. Although it has a dull appearance and is not suitable for prolonged storage, it is, on the whole the best, from an overall point of view.

During the discussion that followed, several points like the effect of addition of fibre or rice bran to polished rice on the metabolism of nitrogen and minerals, administration of vitamin D along with the diet to correct calcium imbalance, the loss of thiamine during storage, need for adopting a combination of the parboiling and calcuring processes, degree of polishing in commercial samples of rice, carry-over effect of previous diets on the metabolism studies, etc., were raised.

The President in his concluding remarks pointed out that varietal differences are likely to exist and indicated that similar experiments should be carried out with other coarse varieties of rice. He further said that in view of the fact that the average consumer does not like to use unpolished rice because of its thick bran layer and difficulty in cooking, it would be a better approach to provide polished rice fortified with calcium and vitamins than providing undermilled rice.

S (IS) 25

The Pilot Plant—What to expect from it, (*Sept.* 20, 1958)—Introducing the subject, Mr Y. K. Raghunath Rao said that the word 'pilot plant' is very widely used, different people meaning different things. He explained how the word was derived from, a word meaning 'to guide and propel'. A pilot plant, he said, has three main objectives: (*a*) to prove the technical feasibility of a process (*b*) to collect design data for scaling up and (*c*) to train the personnel. Though the pilot plant meant a lot of expenditure of time, money and effort, it was sometimes necessary to construct a pilot plant so that the subsequent commercial venture could be started with confidence.

Supplementing, Mr S. K. Lakshminarayana said that in order to set up a pilot plant without much delay, we must have the equipment for the different unit operations. It was on these lines that our pilot plant, or more properly the Unit Operations Laboratory was started 8 years ago. Since then, there have been several additions to it with the result that there is now a wide variety of equipment for most of the common unit operations. In the strict sense of the term, there is only one pilot plant viz., the paste goods plant. But we have enough of the unit operation equipment, and when necessary could assemble these units as a compact unit for a particular process. Any such assembly will need the services of a well equipped workshop. He pointed out that we have excellent workshop facilities and when called upon we could have a regular pilot plant for any process. The workshop and the pilot plant had to work in very close collaboration, if the progress has to be rapid. It was therefore desirable to have them both under common supervision.

Dr Kalbag then discussing the problems of the unit operations laboratory more commonly known as the pilot plant in our Institute, described the plan followed in laying out the positions for different equipment. He explained that factors such as (1) flexibility of operation (2) the needs of the equipment in respect of firm foundations, water steam and electric connections, and (3) space requirements, have to be taken into consideration for the lay-out. He stressed that the pilot plant represented a major investment and as such the best use of it should be made. Enough staff are required for the maintenance and operation of the equipment. It is very essential to collect working data with each equipment, which would be of benefit later. The most important function of the pilot plant is to modify and develop suitable equipment for non-standard operations. It is not possible to have equipment for every conceivable use and as such the pilot plant will be frequently called upon to develop new equipment or modify an existing unit for a new use. In such cases, it is necessary to carry out quick tests to check certain design ideas or collect certain data. The speaker explained all these points with reference to a hypothetical process, wherein he showed the type of data to be collected for standard operations such as centrifuging, filtration etc. Some of the operations such as decuticling or size separations can have special equipment designed for them. Certain other operations, such as drying, he said are done most efficiently in a particular type of unit. In such cases, a detailed study of the operation can produce surprisingly good results. The speaker then dealt with some of the common mistakes committed by most people working in the pilot plant.

During the interesting discussion that followed, several points such as the role of a chemical engineer or food engineer in working a pilot plant, the need for an objective, economic evaluation of projects on their merits for pilot plant trials, providing training for the staff in the proper operation of the various equipment, need for continuous collaboration between the project engineer and the laboratory; fabrication of equipment suited to local conditions, etc., were raised. Answering the points, the speakers said that it would often be necessary to make several changes, sometimes radical, in a laboratory process after it is tried in the pilot plant so that the process might be suitable for commercial exploitation.

Stressing the importance of the subject, the President in his concluding remarks, said that the Food Engineer has an active role to play in the development of a process. He has to help in designing and modifying equipment to suit the process. He emphasized the need for very close collaboration between the engineer and the scientist to work out a process to a success.

TECHNICAL AID TO FOOD INDUSTRIES (*published in July 1954*), pp. xvi + 270.

This publication, contains the views and suggestions of prominent scientists, leading industrialists and food technologists, and Government officials on the nature of technical aid needed by different food industries in the country. Up-to-date technical and statistical data are provided and an appendix embodying the conclusions of the Symposium as well as a comprehensive index are given.

Price: Indian, Rs. 5.00 (*postage extra*); Foreign, 10 shillings; $ 1.75

Information and Advice

IN pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Desiccated Cocoanut

E (IS) 86

I shall appreciate if you could kindly advise me regarding the method of preparation of desiccated cocoanut. (Cochin-2).

Desiccated cocoanut is a commercial product manufactured from the white part of the cocoanut meat after removing the brown parings or testa. The white meat is shredded or disintegrated and dried in hot air driers at 140-170° F to below 2 per cent moisture content. The paring is done by hand, though machines have been devised for the purpose. The pieces of kernel from fresh nuts are first rinsed in running water and fed to disintegrators. The grated meat is passed through shelf driers similar to those used in tea manufacture, the drying time being 20-25 minutes. The dried product is allowed to cool on galvanised tables, sifted into coarse, medium and fine grades, and packed in plywood cases, lined with grease-proof paper. Desiccated cocoanut should be of a snow white colour, possess the fresh taste of the nut, and contain not more than 0.1 per cent free fatty acids.

Desiccated cocoanut is used in the manufacture of cakes, pastries and chocolates. It is an important ingredient of a variety of Indian sweets and chewing compositions.

Specifications for condensed milk

E (IS) 87

Kindly let us know the definition of Condensed Milk according to the Food Adulteration Act? (Delhi).

Condensed Milk means milk which has been concentrated from full cream milk by removal of part of its water with or without the addition of sugar, and includes the article commonly known as 'evaporated milk' but does not include the article commonly known as 'dried milk' or 'milk powder'. It shall be free from preservatives other than sugar and contain at least 31 per cent of milk solids of which at least 9 per cent shall be fat.

Preparation of malt powder from ragi or cholam

E (IS) 88

I am interested in the manufacture of malt powder from ragi or cholam and shall be grateful if you could enlighten me on the subject. (Madras).

From our experiments, we have found that cholam is much better suited to give a good quality and high-flavoured malt product. The yield of malt product in the case of cholam is also much higher than in the case of ragi.

It is very difficult to prepare malt powder which is completely water soluble. However, malt extract could be prepared from the germinated cereal grains which will completely go into solution in water.

To develop maximum malt flavour, the germinated cereal grains after drying is generally roasted in a kiln at fairly high temperatures. This, however, will lead to the partial destruction of the enzymes of the malt. It would, therefore, be more advisable to roast about 25 per cent of the dried germinated grains to produce a very high malt flavour and then mix this up with the rest of the malt powder.

Preparation of condensed milk

E (IS) 89

Kindly send me information regarding the preparation of condensed milk on a small scale. (New Delhi.)

Condensed milk is fresh milk from which considerable portion of water has been evaporated and to which sugar may or may not have been added. The principle of preparing condensed milk is to reduce the boiling point of milk from slightly above 212°F at atmospheric pressure to about 130°-145°F at 25″ of vacuum by using vacuum pans so that the milk boils vigorously without any undesirable change taking place. By providing the means for causing the milk to spray in a fine mist and for carrying off the vapours rapidly, a large percentage of the water of the milk can be removed quickly. The method, in brief, is as follows:

The milk is placed in a preheated tank and is heated to 165° -185° F. The vacuum pan heated with steam is evacuated by means of a pump. Milk is drawn into the pan by this vacuum and as it covers the bottom jacket, steam is permitted to enter. As the milk rises and covers the coils, steam is turned into the coils. The milk is thrown as a spray into the upper section of the retort by vigorous boiling. This assists in rapid evaporation. When the specific gravity as determined by Baume Hydrometer indicates that the required concentration has been attained, the milk is withdrawn and is cooled over surface coolers or in coil vats. If the evaporated milk has been found to comply with the standard, it is put into containers and sterilised. For detailed particulars, you may kindly refer to the following books:

(1) Condensed Milk and Milk Products, by O. F. Hunziker, Published by the author, La Grange, Illinois, U.S.A.

(2) Milk and Milk Products, by C. H. Eckles, W. B. Combs and H. Macy; Published by McGraw Hill Book Co., Inc., New York.

(3) Milk and Milk Products, Published by Industries Publishers Company, Keshub Bhavan, 22, R. G. Kar Road, Shambazar, Calcutta-4.

Chemical composition of arrow-roots from *Maranta arundinacea* Linn

E (IS) 90

I shall be grateful if you could supply us recent information on the chemical composition of arrow-roots obtained from the plant Maranta arundinacea Linn. (Calcutta).

The chemical composition of arrow-root starch from the rhizomes of *Maranta arundinacea* Linn is given below:

Moisture % ...	16. 5
Protein % ...	0. 2
Fat % ...	0· 1
Mineral matter % ...	0. 1
Carbohydrate % ...	83. 1
Calcium (Ca) % ...	0.01
Phosphosus (P) % ...	0.02
Iron (Fe) mg. % ...	1. 0
Calorific value per 100 g. ...	334

Specifications for butter

E (IS) 91

May I request you to please let me know the specifications (chemical standards) for Desi Butter? (Kalyan.)

Butter means the product prepared exclusively from the milk or cream of cow or buffalo or both, with or without the addition of salt and annatto and shall contain not less than 80 per cent of milk fat and not more than 16 per cent of moisture. No preservative is permissible in butter.

Specifications for aerated water

E (IS) 92

Kindly give me the specifications for aerated waters in India. (Madras).

Aerated water, other than soda water means potable water sweetened with sugar, impregnated with carbon dioxide or oxygen or with both, under pressure, with or without admixture of salts of sodium, magnesium or calcium, singly or in combination with or without citric acid and of the permitted flavouring and colouring substances, if any, and shall not contain tartaric acid or phosphoric acid or other mineral acid or any lead or other poisonous metal or any other added substance.

Aerated water shall be deemed to be below the standard of purity if it is manufactured from water which is unfit for drinking purposes or if ice manufactured from such water is inserted in it.

Bulk packaging

E (IS) 93

Will you please let us know the noteworthy features of the improved container for bulk packaging developed by your Institute? (Madras).

The container is particularly suited for bulk packaging, can be folded on all its four sides, and the lid fixed on the collapsed box, which will facilitate easy return of the empties.

The above container may be used either as a crate or as a box for any commodity perishable or otherwise.

This container is capable of performing many journeys, thus not only saving in the constructional material but also in the overall economy of packaging costs.

The above container can be made of any rigid constructional material either natural or synthetic.

This type container is adaptable to numerous variations of size, strength of the materials used, and nature of the hinges, hooks or clips used.

Per capita figures for total protein, animal protein and fat intakes

E (IS) 94

If available, kindly help us to get the latest figures about the percapita total protein, animals protein and fat intakes during 1955/56 *in various countries.* (West Bengal).

The data on population for the year 1955 and the tentative figures for the per capita total protein, animal protein and fat in-takes during 1955/56 in various countries is furnished below:

	Per capita in-take during 1955/56				
	Population in 1955 (millions)	Calories per day	Total protein g/day	Animal protein g/day	Fats and oils (fat content) kg/year
* Australia	9. 3	3,190	88	56	17
Canada	15. 6	3,190	99	64	20
Denmark	4. 4	3,310	89	50	24
U. S. A.	164. 3	3,100	93	64	20
U. K.	51. 2	3,210	83	48	22
West Germany	50. 0	2,970	78	42	22
Switzerland	5. 0	3,090	92	51	17
Norway	3. 4	3,160	89	50	27
New Zealand	2. 1	3,430	104	72	19
China (Mainland)	582. 6	...	...	...	...
France	43. 3	2 830	101	51	12
Ceylon	8. 6	...	...	...	...
Austria	7. 0	2,910	84	40	18
Belgium & Luxemberg	9. 2	2,990	89	44	22
* India	382.00	1,850	50	8	4

* Figures available only for 1954-55.

Equipment for cannery

E (IS) 95

I am thinking of starting a small cannery and shall appreciate if you could give me some information regarding the essential equipment required for starting a cannery. (Nagpur).

The information asked for is given below:

(1) *Fruit washing tanks:* These may be made of aluminium, stainless steel or brick structure with cement plaster. It is preferable to have at least two such tanks as the fruit is sometimes very dirty and needs more than one washing.

(2) *Preparation tables* with aluminium or stainless steel covering on top: The size of tables will depend upon the amount of work you want to do as well as the accommodation available.

(3) *Stainless steel steam jacketed pans:* The size of these pans will depend again on the requirement. Today, between 10 and 40 gallon pans are available. We would like to suggest that it would be helpful to have two of these.

(4) *Pulper:* For making fruit juice and pulps, you should have a small pulper. We would suggest that you may obtain an Indiana Pulper which is the most suitable one for laboratory use and has fairly high capacity.

(5) *Exhaust box:* You may obtain a tank with hot water and steam heating arrangements for exhausting the filled cans. It is quite possible that you can get a continuous Exhaust Box made. This can be made by any of the small manufacturers in the country. The continuous type is being manufactured by Messrs Dynacraft Machine Co., Juhu Lane, Andheri, Bombay.

(6) *Table seamer:* This equipment can only be supplied to you at present by Messrs Metal Box Co. of India Ltd., Barlow House, Chowringhee, Calcutta-20 or by Messrs Gardners Corporation, Connaught Circus, New Delhi.

(7) *Syruping and brining tank:* You can get a stainless steel tank made in India. If you have a good workshop in Nagpur, it should not be difficult for you to get one made. The capacity will again depend upon your requirements. You may have to get appropriate type of taps for filling the cans. You must also procure equipment such as pineapple cutters, corers and ordinary cutting, coring and peeling stainless steel knives as well as holding tongs.

(8) *Retort or pressure cooker:* If your requirements for processing vegetables are small, you may purchase a large size household pressure cooker.

(9) *Cooling tank:* You can make a cooling tank of masonry structure with cement plaster. If you desire large production, you may have to make arrangements for water circulation with a water cooling tower.

(10) *Scales and balances* for use in the pilot plant.

(11) *Vacuum pan* for concentration of liquids and pulps; This is a large scale equipment and perhaps, you may consider buying it at a later date. Most of the canners in the country concentrate their products in open pans at present with the exception of a few firms.

(12) *Can reforming unit* consists of can body reformer, flanger and the different guages and equipment required with it.

Laboratory equipment for a cannery

E (IS) 96

Please let me know what equipments are required in the laboratory of a cannery. (Nagpur).

Laboratory equipment required for operating the cannery would be as follows:

(*a*) Refractometers of different ranges.
(*b*) Hydrometers and salometers.
(*c*) Chemical re-agents for determining the acidity, alcoholity, salt, etc.
(*d*) Glass equipment for the above.
(*e*) Equipment for microbiological work if you do not have a separate laboratory for the purpose.
(*f*) Chemical weighing balance.

BROCHURE ON HOME-SCALE FOOD PREPARATIONS SERIES

This brochure contains 66 leaflets on the preparation and preservation of fruit, vegetable and other food products. It is divided into three parts, *viz.*, the 'Home-scale Fruit and Vegetable Preparations Series' giving recipes for the preparation of 55 fruit and vegetable products together with a list of the equipment required for their cottage-scale preparation; 'Indian Sweet Series' giving methods of preparation and preservation of 3 kinds of typical Indian sweets; and the 'Substitute Foods Series' giving in detail the methods of preparation of 8 substitute foods and food products. **Price:** Re 1.00 (*postage extra*)

Notes and News

STATISTICAL NOTES

All-India Final Estimates of Black Pepper and Dry Ginger, 1957-1958

Crop	Area (hundred acres)		Production (hundred tons)	
	1957-58 (Final Estimate)	1956-57 (Partially Revised Estimate)	1957-58 Final Estimate	1956-57 Partially Revised Estimate
Black Repper ...	2290	2209	264	273
Dry Ginger ...	388	393	140	150

(*Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India*)

NEWS BRIEFS

Insecticide residues: The flavour of canned fruits and vegetables is liable to be affected by insecticides sprayed on the trees or soil. A particularly effective insecticide is the isomer of hexachlorocyclohexane (HCH), known as Lindane, which has a less disagreeable odour than technical H.C.H. Research carried out at the Central Laboratory of the Belgian Ministry of Economic Affairs, Brussels, has shown that Lindane is partly decomposed under the influence of heat. During sterilisation, the quantity of vegetables was found to be reduced by 63 per cent. On the other hand, the disagreeable flavour and odour of the remaining insecticide becomes more marked. These organoleptic properties often appear after sterilisation, although they could not be detected beforehand. (*Food Manuf.*, June 1958, p. 253).

Vitamins in vegetables: Quantitative chemical analysis was used to determine the content of ascorbic acid, thiamine and riboflavine in raw and preserved vegetables-*i.e.*, peas, beans, cucumbers, tomatoes and carrots; the carotene content of carrots was also investigated. Preserves were also made from raw materials which had been previously analysed in a raw state, the preserves also being analysed after 6 months' storage. The value of vegetables as a source of vitamins was determined from the results.

Preserved mashed tomatoes proved to be particularly valuable source of ascorbic acid, and carrots were found to contain substantial amounts of carotene. The remainder of the preserves proved to be only moderately good to meagre sources of vitamins. (*Food Manuf.*, June, 1958, p. 253).

Centrifuges: The range of Super-D-Canter centrifuges made by Sharples Centrifuges, Ltd., has been increased by the Addition of 2 new models, the P 4000 and the P 7000.

A new design concept has been introduced into the construction of these scroll discharge type centrifuges. It is stated that the new design gives an increased performance and capacity exceeding that previously believed to be possible with this type of machine.

These machines are vertically mounted and have a self-centering bowl. Sharples claim that this design allows the gearbox to be made integral with the bowl and thus the spline shaft used can be short. In this way a satisfactory gearbox can be made for handling large solids capacities. The new models operate at centrifugal forces of up to 31000 S. (*Food Manuf.*, June 1958, p. 254).

Australian trials on blast freezing of meat: Australian scientists are experimenting with new method of blast freezing meat to cope with the demand which is expected to develop in world markets. By the blast freezing process meat is frozen in a few minutes.

Experiments being conducted by the Commonwealth Scientific and Industrial Research Organisation are aimed at developing this technique to the point where blast frozen meat will hold high quality for anything up to six months in storage. Preliminary results of research have already been published and circulated to the meat industry. (*Food Trade Rev.*, June 1958, p. 4).

Variations in temperature cut concentrate counts: Low plate counts on frozen orange concentrate may be the result of unfavourable time and temperature storage conditions, that are deleterious to juice quality. This was indicated in tests made on samples from 5 lots of California juice manufactured in the 1952-1953 season. During storage, juice was subjected to time-temperature exposure cycles similar to those that occur in cold storage warehouses. Samples had counts of 176,000, 89,000, 290,000 and 220,000 per ml. initially. Concentrates stored at 10°F. for the 9-month test period averaged 30 per cent survival; at -80°F. survival was 86 per cent. Coliforms were found in 4 of the 5 lots at start of the tests, but they were practically eliminated by storage conditions. While storage above 0°F. seemed to be beneficial as far as bacterial content was concerned, other unfavourable reactions occur, such as loss of cloud, and flavour changes. (*Food Engng.* June 1958, p. 107).

Fruit freezing levels: The U.S. Department of Agriculture has published a research report giving the freezing point temperatures for the major fruits, vegetables, and nuts, and many kinds of florist stocks. According to the report most fruits freeze at 27 to 30 deg. F. Among numerous exceptions, dates are the most prominent having a freezing point around zero. These figures however should not be accepted as safe levels of temperature for refrigerated goods. Some vegetables are affected by a 'chilling injury' when stored at temperatures much higher than the freezing point and do not ripen properly as a result of such injury. This report ought to be useful to growers and shippers as an index to refrigeration practices and the natural low temperatures when damage might occur. (*Indian Food Packer*, May 1958, p. 15).

Seed enzymes affect can lacquer: The beta-glucosidase present in the seeds of fruit may cause serious corrosion of lacquered cans even though the can contents are microbiologically sterile, unless the package is subjected to a heat treatment for almost 12 minutes. Cherry stones do not lose their peroxidases even after being processed for 12 minutes at 212 deg. F., while beta glucosidase activity in the stones was still evident after 30 weeks of storage. A six minute treatment destroys the peroxidases in plums, but in order to eliminate beta-glucosidase, a 12 minutes cooking followed by a 10 minutes vacuum treatment was found necessary. Plain cans are not affected by these enzymes (*Indian Food Packer*, May 1958, p. 15).

Plastic milk bottle: A plastic milk container has been recently developed in Switzerland. It is harder, transparent and heat resistant up to 265 deg. F. The shape and volume are not susceptible to temperature and pressure changes. It is reported to be unbreakable, light and cheap. For cleaning purposes, however changes are necessary in the mechanical washers. The new bottle should be of interest in this country where various large scale dairy projects are under way (*Indian Food Packer*, May 1958, p. 15).

Spray drying increases garlic stability: The spray drying of garlic and onion products in preference to dehydration is found to increase their stability without impairing their flavour. These new products designated Dolcoseal Onion and Garlic are non-hydroscopic and find ready use in the manufacture of sauces, dry soups, canned meats, sausage, pickles, catsup, and salad dressings. The powders yield clear, stable solutions; 1 lb. of spray dried onion is equal to 10 lb. of the natural onion. 1 lb. of garlic powder can replace 5 lb. of cleaned natural garlic buds. (*Indian Food Packer*, May 1958, p. 17).

Rapid test estimates bacterial count in five hours: A rapid method for estimating the bacterial content of pre-cooked frozen foods is described. The new technique is a modification of the resazurin reduction method and required only 3-5 hours. Best results are obtained with this test when the contamination is great and a large number of bacteria are present (*Food Technol. Austr.*, July 1958, p. 399).

Test for freshness of fish: moistened test paper impregnated with a tetrazolium salt is applied to the fish surface for a standard time, and the colour is then eluted and its intensity determined in a colourimeter or spectrophotometer. It is hoped that eventually direct visual comparison of the paper with a colour chart will be sufficient. Good correlation was obtained between this method of assessing fish quality and other methods, including taste panels (*Food Technol.* July 1958, p. 399).

Jelly from fruit juice concentrates: A team of U.S. Department of Agriculture Scientists at the Western Utilization Research and Development Division, Albany, California, has developed a new method of making jelly, using fruit juice concentrates rather than single-strength juices. The new method offers advantages in operational economy and quality control over the traditional batch process.

Instead of cooking single-strength juice in kettles with sugar and other ingredients until enough water is evaporated to make jelly, these workers propose pumping measured amounts of cold fruit-juice concentrate, cold pectin solution, and hot sugar syrup together to make jelly continuously. The result is a jelly of good colour and flavour undamaged by long cooking. It is not necessary to heat the jelly to a temperature higher than 180° F. required to pasteurize the product.

In making jelly by this continuous process, the hot syrup is prepared and held in a tank at just below the boiling point. A cold pectin solution is prepared in a second tank. The concentrated juice, with flavour essence and fruit acid added if desired is held in a third tank. Metering pumps force these three ingredients together in a mixing pipe, one portion of which is steam-jacketed to bring the temperature of the jelly mixture upto 180° F. for filling into glasses.

Availability of high quality fruit-juice concentrates is the key to commercial use of the new jelly-making method. The concentrates (natural juices from which some of the water has been removed) are now produced commercially in limited quantities by low temperature concentration under high vacuum. Some of the natural fruit flavour vaporizes during concentration but it can be collected and added back to the final product.

By using such essence-fortified fruit-juice concentrates in continuous jelly making, it is possible, the researchers said, to make jellies of excellent flavour and colour, because the temperature of the product is kept below boiling.

Natural juice and flavour concentrates can be frozen and shipped to jelly makers at considerable savings in storage and shipping charges as compared with the cost of handling single-strength fruit juices.

The concentrates can also be depectinized and clarified to give jelly makers a superior product, it is claimed. (*Food*, May 1958, p. 186.)

Colour behaviour of canned fish: Canadian processors are using glycerine in a new rapid test to predict the colour behaviour of canned fish, according to the Glycerine Producer's Association, New York. Slices of raw fish when dipped in glycerine at 435°F. show a colour change similar to that caused by processing. Based on the colour change which occurs after the glycerine dip, subsequent fading in processing can be prevented by treating the fish with a sodium nitrate solution. Colour changes are especially difficult to predict in the processing of salmon and prior to the glycerine test workers had difficulty in sorting the raw meat on a colour basis before canning. (*Food*, May 1958, p. 202).

NEW INDIAN STANDARDS

Dieldrin, technical: The name 'Dieldrin' has been assigned to the chemical which comprises a number of chemically related insecticidal compounds. It is a comparatively new entrant in the field of pest control chemicals and is gaining importance. The Indian Standard Specification for Dieldrin, Technical (IS: 1052—1957) has been prepared to facilitate supply of the material of a quality most suitable to tropical and sub-tropical conditions.

This standard is one of a series of Indian Standards on pesticides. Other standards published so far in the series relate to BHC, DDT, pyrethrum extracts, nicotine sulphate, lime sulphur solution, etc.

The standard lays down methods for the determination of moisture content, endo-exo HEOD content, matter insoluble in xylene and acidity.

In order to ensure that the sample taken for the test is truly representative of the consignment, a method of sampling based on statistical considerations has also been specified (*ISI Bull.*, May 1958, p. 142).

Corn flakes: Corn flakes are commonly used for breakfast. When enriched with vitamins, they are popularly known as 'vitaminized corn flakes'. The Indian Standard Specification for Corn Flakes (IS: 1158—1957) covers vitaminized corn flakes, enriched with thiamine, riboflavin and niacin, in addition to the ordinary variety of corn flakes.

The standard specifies limits for moisture, total ash, acid insoluble ash, crude fibre, etc. Methods of test for determining conformity to the requirements have also been included.

The mode of packing of the material has been laid down to ensure that it reaches the consumer in good condition (*ISI Bull.*, May 1958, p. 142.

Suji or Rava: In certain parts of the country, the terms Suji and rava are used as synonyms, while in other parts they denote materials of two different particle sizes. Consequently, two grades of the material, which differ only in particle size, have been specified in the Indian Standard Specification for suji or rava (IS: 1010-1957).

Physical and chemical requirements of the material have been specified in the standard. Physical requirements relate to particle size and microscopic appearance. Chemical requirements cover moisture content, total ash, acid insoluble ash, gluten and acidity. Methods of test for ensuring conformity to these requirements have also been included.

When chemical analysis would determine the chemical purity of the material, microscopic examination has been laid down for detection of adulteration with other cereal products, or the cereal products, or the presence of undesirable materials. (*ISI Bull.*, May 1958, p. 142).

DRAFT INDIAN STANDARDS

Cocoa Products: Three cocoa products have been covered by the following draft Indian Standard Specifications: (1) Covering Chocolate, (2) Cocoa-Powder, (3) Cocoa-Butter. Covering chocolate, also known as 'chocolate couverture' is used for coating a wide variety of substances, like nuts and fruits, ice cream, etc., and for making eating chocolate and other chocolate confectionery.

Requirements for various grades of the material prescribed in the draft Indian Standard Specification for Covering Chocolate are for moisture content, total fat, sugar, total ash, acid insoluble ash, crude fibre, starch, etc.

Cocoa Powder is largely used for the preparation of cocoa beverage and also for the manufacture of certain chocolate confectionery. The requirements for fat content for both the purposes is not the same. Consequently, in the draft Indian Standard Specification for Cocoa-Powder, the material has been divided into two types, namely drinking cocoa powder and low-fat cocoa-powder. In order to ensure the quality of the material, besides requirements for moisture, total ash, acid insoluble ash, alkalinity of ash and crude fibre, a range for particles sizes has been specified. The visual detection of adulteration of cocoa-powder has been made possible by the inclusion of microscopic examination of the material.

Cocoa Butter, which is the fat of the cocoa-bean is used mainly for the preparation of chocolate, and to a small extent for pharmaceutical preparations and cosmetics. In the draft Indian Standard Specification for Cocoa Butter, requirements for refractive index, specific gravity, melting point, saponification value, iodine value and acid value have been specified. The results of all these, when interpreted, enable the analyst to determine the purity of the sample. In addition, a test based on the 'critical temperature of dissolution of cocoa-butter in acetic acid' has been prescribed. With the help of this, it is possible to detect admixture of cocoa-butter with oils of cocoanut, palm kernel, corn, groundnut, cottonseed, etc., and their stearins.

In all the three draft standards, methods of sampling, packing and marking have been specified.

The chocolate and cocoa-powder industry in this country is protected industry and the preparation of standards for these items was undertaken at the instance of the Tariff Commission. It is hoped that these standards would ultimately help the industry to produce quality goods (*ISI Bull.*, May 1958, p. 146).

PATENTS

Indian

(A few of the Patent applications notified as accepted in Part III, Section 2 of the Gazette of India from 12th April, to 3rd May 1958, are listed below):

57838. *Improvements in tea-crushing and tea-screening machinery:* Comprises one or more pairs of rollers of flexible material with circumferential flanger which interdigitate with those of complementary rollers and means for driving them—Patented by W. A. Kerr.

59270. *Improvements in screens for size separation of solid particles:* Smooth flexible filaments are assembled in a frame parallel to one another under tension.—Patented by E. Mare.

59411. *Process for the manufacture of cooled or heated bulk material during its conveyance as a layer, and apparatus therefor:* Depth of layer of material is caused to vary along the length of the conveyor and the pressure difference causing the air to flow through the layer is kept constant.—Patented by F. L. Smidth and Co., A/S.

60921. *Improvements in the method for manufacture of ether:* Comprises vapour phase catalytic dehydration of alcohol in fluidised catalyst bed of activated bauxite or alumina.—Patented by Council of Scientific and Inudstrial Research.

62070. *A continuosly working mixing and kneading worm:* Worm vanes arranged on an uninterrupted helical line are inclined in relation to this helical line.—Patented by Buss. A. G.

62333. *Coffee making machine:* Comprising a container with a perforated base, a perforated double disc within container, cylinder having a piston disposed above container and means for piston operation.—Patented by Officine Faema, S.P.A.

62562. *Improved insect-repellant compositions:* One or more liquid insect repellant compounds in association with a gelling agent.—Patented by Boots Pure Drug Company Ltd.

58588. *Improved method and apparatus for manufacturing paper or fibrous board:* By adding subsequent layers of watery pulp on opposite faces of base layers and dewatering the same from exposed surfaces.—Patented by St Anne's Board Mill Company, Ltd.

59687. *Production of tetracycline:* Adding to a fermentation medium with tetracycline—producing micro-organism of the germs *streptomyces* a 2, 5-Substituted 1, 3, 4-azole.—Patented by American Cyanamid Company.

61076. *Process for the production of tetracycline:* A Chlorotetracycline producing species of streptomyeer is grown in a culture medium in the presence of a compound selected from the group comprising a thiazole or thiol—Patented by Bristol Laboratories, Inc.

61622. *Clarification, settling and like tanks:* Clarification equipment and facility for accommodating surges in supply are embodied in single unit.—Patented by Dorr-Oliver Incorporated.

59806. *Process for the separation of mixtures of liquids:* Separating by partial vaporisation or partial condensation in presence of layers of large surface solid bodies which are warmer than the mixture and whose infra-red oscillation bands of one of the components of liquid mixture.—Patented by Cassella Farbwerke Mainkur Aktiengesellschaft.

57976. *Improvements in or relating to the stabilization of Polyethylene:* Comprising polyethylene and at least one antioxidant selected from the group consisting of norhydroguairetic acid propyl gallate and a 4, 4'-bis-2-alkyl phenol compound.—Patented by The Dow Chemical Company.

58999. *Method of producing L-glutanic acids:* Bioten is added to the culture medium and the Ph is adjusted to 6-9.—Patented by Kyowa Hakko Kogyo Kabushiki Kaisha.

62681. *Improvements in or relating to the fitting of tins and like containers with handles:* Two holes pierced into the body of container closed by lugs, the outer ends of said lugs having circumferential groove in which ends of handles may be press fitted—Patented by The Metal Box Company of India Limited.

Foreign

792,651. *Fish processing:* An object of the present invention is to provide a method of skinning fish and then freezing the fish flesh from the skeleton. A headed, gutted and finned fish is heat-treated or blanched by briefly heating at a temperature in the region of 200°—225°F. by any suitable method. The time required for the process depends largely upon the size of the fish and the temperature of treatment. Moist heat should be used at temperatures above 225° F. After blanching the fish is subjected to a high-pressure stream of water, steam or air to roll back and detach the skin of the fish. The pressure required is usually in the region of 50/100 lb. /sq. in. and it should be directed at an angle of about 45° for the utmost effect. The fish is then cooked to loosen the flesh from the bones. This is not complete but only enough to loosen the flesh, which is then separated by a jarring action and screening such as is provided by a perforated tumbling barrel or a vibrating screen. The bones are separated from the fish flakes by hand or gravity separation or any other suitable means. The flesh is recovered and rinsed.—Patented by Birds Eye (Holdings) Ltd. (*Food Manuf.*, June 1958, p. 264.)

793,580. *Preserving foods:* This invention relates to the preservation of food products, particularly those which are packed in jars. It is stated that in the vapour-vacuum method of sealing jars it is usual for the jars to be set aside to cool after the hot products and the vapour have been added to the jars. The length of time taken by the jars to cool varies according to the size of the jars and their contents, but there is no doubt that a large storage space is required while the products are cooling. Attempts have been made to use cold water to reduce the temperature of the jars, but the water frequently gains access to the jar before sufficient time has elapsed for an air-tight seal to be formed. According to the invention a method is proposed in which the upper portion of the hot jars is cooled by cold air being directed against them after sufficient time has elapsed for the vapour to condense and form a seal. Cold water is afterwards directed against the jar to cool it and its contents. Between the addition of the lid and the application of the cold air steam may be blown against the lid to sterilise it. Apparatus for performing the operation has a tunnel structure with a conveyor running through it. Nozzles are provided for directing jets of steam, cold air and cold water, the jars passing through the jets of different media in that order.—Patented by Robert Kellie and Son, Ltd. (*Food Manuf.*, June 1958, p. 264).

793,486. *Improved filter press:* This invention relates to an improvement in the construction of filter presses, particularly those used for filtering beet sugar juices, which enables the collected filter mud to be removed from the filters without the machine being dismantled or even opened. There is provided a filter press with a closed container in which there are a number of filter frames, each of which is covered with a filter cloth. The sugar juice is passed into the container and passes through the filter cloth to the interior space of the filter frames leaving the mud on their exterior. The filtrate flows through special conduits and out. The impurities in the form of this mud are removed by means of a water spray emitted from a turntable and longitudinally movable, water-carrying pipe with nozzles. It is claimed that the filter press not only reduces the inconvenience of removing the mud but also reduces the space required by the filter press.—Patented by Roman Szarejko (*Food Manuf.*, June 1958, p. 264)

794,274. *Preserving fruit:* Relates to compositions containing diphenyl and to their use in the preservation of fruit and other agricultural products especially citrus fruit such as oranges, grapefruit, tangerines and lemons: wrapping materials are coated or impregnated with a composition containing diphenyl and liquid hydrogenated polyphenyl.—Patented by Monsanto Chemicals Ltd. (*Food Trade Rev.*, June 1958, p. 55).

794,240. *Food Package:* The object is to provide a container and package structure adapted for the moulding, carrying and dispensing of surface-decorated soft plastic foods without requiring the use of any backing or support for the decorated walls of the container while at the same time permitting the food body to be dispensed without marring its decorated surfaces: the package comprising an open-ended tabular container formed of an unbacked sheet of thermoplastic material is particularly useful for foods, such as butter, margarine, ice cream, gelatinous foods and meat spreads which are sufficiently firm to be shape retaining at temperatures of normal use, but sufficiently soft to be easily deformed under slight pressures and temperature increase.—Patented by Leo Peters (*Food Trade R*
June 1958, p. 55).

794,662. *Sterilising milk:* R
lates to a method of sterilising
comprising the steps of feeding
in bottles into a sterilising tu
closing the tunnel and injecti
steam thereto to effect sterilisi
and sebsequently transferring
bottles to.a separate cooling devi
where they are turned to elimi
the tendency to form a skin during cooling, prior to crating.—Patented by Stanley Cross (*Food Trade Rev.*, June 1958, p. 55).

793,976. *Tea:* To preserve tea from mould growth it is packed in wrapping paper which has been coated or impregnated with a solution of benzoic acid in aqueous isopropyl alcohol.—Patented by Monsanto Chemicals, Ltd. (*Food Trade Rev.*, June 1958, p. 55).

793,569. *Carbonated beverages:* Relates to apparatus for preparing a non-alcoholic carbonated beverage comprising the combination of pasteurising means through which the beverage liquid is continuously passed, with a carbonating device to which the pasteurised and cooled liquid is delivered, and in which it is subjected to carbon dioxide gas under pressure; heat exchange means to which the carbonated liquid is delivered for cooling, and receiving or accumulating means for the carbonated liquid in which it is maintained under a desired pressure.—Patented by Meyer Liquid, Ltd. (*Food Trade Rev.*, June 1958, p. 56).

794050. *Nutrient liquid:* Relates to a process for producing from the dried endosperm of fully ripened coconuts, a nutrient liquid in the form of a rich creamy emulsion containing fat, proteins and carbohydrates sufficient in kind and amount to constitute almost a whole food product and usable in the same manner as cow's cream or milk (according to its fat percentage).—Patented by Skinner Corporation (*Food Trade Rev.*, June 1958, p. 56).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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(*Bulletin of the Pan-American Health Office*)

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(*Nutrition*)

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (Cftri)

The use of mammalian milk and processed milk foods in the feeding of infants, by Chandrasekhara, M. R., *et al.*, *Indian J. Child Hlth.*, October 1957, p. 701.—The AA have reviewed in this paper the problems involved in the artificial feeding of infants with fresh mammalian milk and with processed infant foods. The daily dietary requirements of infants upto one year are given in a table and the milk used for feeding the child should besides meeting these requisites, be free from harmful bacteria and should be readily digestible. The mechanism of digestion of milk in the infants system has been described. The chemical composition of human, cow's and buffalo's milk is given in a table and the essential difference between the three milks has been discussed with reference to protein, fat, carbohydrates, minerals and vitamins. The amino-acid compositions of mature milks from the above sources has also been compared. The high buffering capacity, higher calcium and phosphorus contents and the higher casein content of cow's or buffalo milk lead to digestive troubles. In addition to these, buffalo milk has a higher fat content and has to be partially skimmed before feeding it to the infant. The high curd tension observed with cow's or buffalo milk can be reduced by (1) boiling and dilution (2) acidifying with organic acids and (3) by citrating. The proportions of milk, water, sugar, fruit juice, shark liver oil, etc., required for infants of varying ages has been tabulated. Results of comparative feeding trials on infants with cow's and human milk show that cow's milk is nutritionally much superior to human milk. Use of cow's or buffalo milk, however, entails certain disadvantages such as difficulty in obtaining hygienically satisfactory milk, poor keeping quality, non-availability etc. These defects can be overcome by using processed milk foods as partial or complete substitute for mother's milk. The general outline of the method of preparation of infant foods and their nutritive value has been described. The composition of some of the proprietory infant foods available on the market is also given and the need for the production of infant food in India has been stressed.

K.L.R.

Role of ferrous iron in enzymatic transamination, by Patwardhan, M. V., *Nature*, 1958, **181,** 187.—Metals such as aluminium, nickel, copper and iron are known to influence non-enzymatic transaminations but their role in enzymatic reactions is still doubtful. In this preliminary note, the A. reports the possibility of ferrous iron being involved in the enzymatic transamination. The enzyme *viz.*, aspartic-glutamic transaminase has been prepared from fresh green beans of *Dolichos lablab* and then purified. Aluminium, nickel, copper, magnesium, manganese and cobalt did not affect the enzyme activity. Ferrous sulphate increased the activity of the enzyme while mercurous chloride completely inhibited it. Dialysis of the enzyme against 8-oxyquinoline solution (0.005M) for 17 hour in the cold reduced the activity but it was, however, fully restored by adding about 5 mg. of ferrous iron to the reaction mixture. Ferric iron was found to be inactive. Addition of iron truders such as glutathione, versene (disodium salt) O-Phenanthrotine and -dipyridyl inhibited the enzyme activity by 10-20 per cent. Cyanide destroyed the activity completely while 8-oxyquinoline had no effect. The results definitely indicate for the first time that a metal is involved in enzymatic transamination.

K.L.R.

Vegetable milk curd from groundnuts, by Subramanyan, V., Bhatia, D. S. and Subramanian N., *Res. & Ind.*, 1958, 3 (5), 121.—Vegetable milk and milk products from soyabean are widely consumed in far-eastern countries. The AA have described a method for processing groundnut for preparing vegetable milk curds. The method in brief is to decorticate the groundnuts, roast the kernels to facilitate removal of the red cuticle and germ, make the clean kernels into a paste in a pulveriser and mix the paste with six parts of water. After filtering, the pH of the emulsion is adjusted to 6.8-7.0 and it is then deodorised by bubbling steam for about 30-45 mins. The milk is cooled, fortified with requisite amounts of various minerals and vitamins and then homogenised. Invert sugar (1 per cent) of 55°B is added to the milk which is seeded with ordinary buttermilk at 37-38°C. After about 12 hrs, the milk sets to a thick curd. The chemical composition of the curd thus obtained is given. The product can be used to supplement the inadequate supply of animal milk in different parts of the country. It also offers a practical possibility of fortifying diets with calcium, vitamins and other nutrients. The yield of curd is 8 lb. for every pound of decuticled groundnut. The cost estimates for the installation of a plant with a production capacity of 1000 lb. of curd per day are given. Cost of the curd works out to be about 13 nP per pound.

K.L.R.

Studies on the antibacterial activity of spices, by Subrahmanyan, V., *et al.*, *J. sci. industr. Res.*, 1957, **16 C** (12), 240.—Spices are very commonly used as adjuncts in several food preparations to increase their palatability and also in Indian system of medicine for the treatment of intestinal disorders. The AA have therefore carried out *in vitro* studies to find out the effect of the more commonly used spices and condiments on the growth of bacteria commonly inhabiting the intestines. Cardamom, ginger, mustard, dried red chillies, cinnanion, cloves, aniseed, *ajowan*, cumin, oxion, garlic, asafoetida and black pepper have been tried on different micro-organisms, viz., *E. coli*, *A. aerogenes*, *L. Casei*, *S. faecalis*, *S. aureus*, and *Shiggella sonnei*. Water extract of the spices have been used and the bactericidal action determined by the cup and plate method. The results show that garlic is the most potent spice, inhibiting the growth of *E. Coli*, *A. aerogenes*, *S. aurens and Shigella Sonnei*. Garlic extract is, however, not active against *L. Casei and S. faecalis*, probably due to the low concentration used. The other spices do not have much inhibiting effect.

K.L.R.

PART II (Indian)

BIOCHEMISTRY AND NUTRITION

Non-availability of inorganic nutrients in agar media to micro-organisms, by Iswaran, V., *J. sci. industr. Res.*, 1958, **17 C** (9), 140.—The availability of inorganic nutrients such as sodium chloride, magnesium sulphate and potassium hydrogen phosphate contained in agar media for the micro-organisms growing on it has been investigated by estimating the amounts of the salts released from frozen agar gel on thawing.

These studies have revealed that all the nutrient in the agar medium is not available for micro-organisms growing on it and the amount actually released on thawing does not represent the amount that is available for the organisms but is far in excess of what is required by them. This is confirmed by the paucity of growth of Azotobacter in liquid media having the same concentration of sodium chloride as the agar medium. This indicates that much larger concentrations of nutrients can be employed in agar media than in liquid media for the growth of micro-organisms.

Biological availability of riboflavin from palm Gur, by Joshi, M. R., and Kamala Sohonie., *J. sci. industr. Res.*, 1958, **17 C** (9), 142.—Studies on the biological availability of riboflavin from the palmyrah (Rorassus flabelliformis) variety of palm *gur* carried out with white albino rats as the experimental animals indicate that the riboflavin in palm *gur* is present in a readily available form.

Studies in vitamin E molybdenum inter-relationships. Metabolism of phosphorus, creatine-creatinine molybdenum and vitamin E in the albino rat, by Nair, P. P. and Magar, N. G. *Indian J. med. Res.*, 1958, **46** (4), 561.—The administration of molybdenum to albino rats was characterized by increased excretion of urinary phosphorus. Molybdenum was found to induce a creatinuria accompanied by a decrease in creatinine excretion. Simultaneous doses of vitamin E, partially reversed the effect of molybdenum. Simultaneous doses of vitamin E in molybdenum-supplemented rats induced a decrease in excretion of molybdenum by an *invivo* retention in the tissues. Experiments indicated that vitamin E increased the retention of molybdenum in the intestine, liver and heart. Serum vitamin E levels remained unaffected in presence of molybdenum.

Paper chromatographic studies on the mineral constituents of the edible muscles, by Joshi, N. V., Barnabas, J. and Barnabas, T., *Indian J. med. Res.*, 1958, **46** (4), 571.—The AA have studied the distribution of mineral elements in edible muscles by using newly developed solvent systems for the chromatographic analysis, with special attention to the meats eaten by the hunter tribes of Maharashtra. Eight representative animals were selected for the study. The muscle tissue of the animals was dried and ashed. The ash was taken up in 5N hydrochloric acid and the acidity of the extract was adjusted to 1N. Interfering anions were removed by passing the diluted extract through the ion-exchange resin, Zeo karb 215. The cations adsorbed on the resin column were eluted with 5 N HCl. The minerals present in the acid extract of the muscle ash were identified by running mixed chromatograms as well as by applying colour tests. Copper, cobalt and nickel; iron and aluminium; zinc; manganese; and calcium, magnesium, sodium and potassium have been identified in the ash extracts using different solvent systems. Barium and strontium were found to be absent. The amounts of calcium, iron and phosphorus present in different edible muscles were estimated by chemical analysis and the results have been given in a table.

K.L.R.

Studies on lipid metabolism on the effect of different food fats on the cholesterol lipid phosphorus ratio in plasma and tissues of rats and the role of glucosecyclo-aceto acetate on this ratio, by Nath, M. C. and Saikia, A., *Indian J. med. Res.*, 1958 **46** (4), 579.—The feeding experiment with different animals and vegetable fats has been performed for 26 weeks. Free, total, ester cholesterol, lipid phosphorus, phospholipid and C/P ratio (total cholesterol/lipid phosphorus) were estimated from the plasma, liver, intestine, kidney and adrenal. The C/P (total cholesterol/lipid phosphorus) ratio in plasma and tissue of animals were also calculated for 3 weeks after 23 weeks of experiment with different oils and fats. Liver fats and their iodine values and growth of the animals were also recorded. Administration of ground-nut and sesame oil with higher iodine values has been found to show low cholesterol levels in plasma and tissues than the fats with low iodine values. The C/P (total cholesterol/lipid phosphorus) ratio in the plasma and tissues of animals kept on fats have also been found to be much higher than those with oils. Hydrolyzed glucose-cyclo-acetoacetate while injected to the dalda group animals has also been found to show lower C/P ratio in plasma and tissues of the animals. It has been shown that the effect of dietary fats on cholesterol and phospholipid levels is a function of their iodine values though in some cases this does not adhere to strictly.

A survey of dietary intake in a group of poor, pregnant and lactating women, by Swaran Pasricha, *Indian J. med. Res.*, 1958, **46** (4), 605.—A survey of dietary intake of a group of 100 pregnant women and 70 lactating women belonging to the poor socio-economic group was carried out. The survey revealed that the diet was generally inadequate with regard to the intake of calories, proteins and calcium. There was direct relationship between the intake of the nutrients and the per capita income of the family. The diets of the women during pregnancy were generally even less satisfactory than in their non-pregnant state. This was partly due to ignorance and partly due to economic factors.

Influence of cooking on the nutritional values of foods, Part IV. Further data on thiamine, riboflavin and nicotinic acid content of cooked foods, Pai, M. L., *Indian J. med. Res.*, 1958, **46** (4), 609.—The A. has analysed 37 different food preparations made out of vegetables, cereals and pulses for their thiamine, riboflavin and nicotinic acid contents in the raw as well as cooked conditions. The method of preparation of the items of food is briefly given. The results show that the loss of thiamine due to washing ranges from 4.42 to 22.78 per cent in the various articles while the loss due to cooking varies widely from 1.60 to 55.45 per cent. The losses of riboflavin and nicotinic acid are found to vary from 0.61 to 48.4 per cent and 3.26-29.92 per cent due to washing, and 3.06—35.8 per cent and 2.35—37.99 per cent due to cooking respectively. Direct heat method of cooking causes higher losses of the vitamins than either by the method of steam cooking in an ordinary cooker or by a pressure cooker, thus indicating the preference of the latter two methods over the former.

K.L.R.

Studies on the metabolic role of medicinal (Ayurvedic) calcium preparations. Their effect upon growth and calcium balance, by Motlag, D. B. and Nath, M. C., *Indian J. med. Res.*, 1958, **46** (4), 616.—Effect of different calcium preparations as Mukta-Bhasma, Praval-bhasma and Shankha-bhasma upon weight growth and calcium balance of rats has been studied and compared to that of calcium carbonate and calcium lactate. It was observed that rate of gain in weight as well as the total gain in weight was higher in the groups receiving Praval-bhasma and Mukta-bhasma than that observed in groups receiving other calcium salts. There is a close relationship between the calcium balance and weight growth. The absolute amount of calcium retained increases as the weight increases. Relation of calcium retention to calcium intake and growth in weight of different calcium salts has been compared. In both cases Mukta-bhasma and Praval-bhasma seem to give better results. Effect of these calcium preparations upon phosphorus balance has also been studied and discussed.

Pulses as food proteins, Esh, G. C., *J. Proc. Inst. Chem.*, 1958, **30** (Part I), 21.—Although Pulse proteins are deficient in one or more essential amino acids when compared to reference proteins (egg or milk protein) and they are a little less digestible, they are efficient in maintaining normal health and growth when consumed in greater quantities. They are however better utilised in mixed protein diets due to supplementary effect of various proteins and due to change in the pattern of amino acids available during digestion *in vivo*. While our knowledge regarding the position of available plant proteins in our health and disease is not fully known recent studies tend to indicate that pulse proteins are also efficient in removing some of the characteristic syndromes of protein deficiency states such as in Kwashiorkor. Limited data collected so far tend to indicate that not only the different varieties differ in their protein contents, there may be wide variation in the protein content, amino acid distribution and the overall nutritive value of the same variety of pulse depending upon the strain, fertilisation, soil type and other agronomical conditions under which pulses are raised. Further work is necessary to find out the optimum conditions under which pulses should be grown so that yield should be higher and the overall protein value may be satisfactory.

Studies on the mechanism of blood coagulation by proteolytic enzymes. Part III. Role of inhibitors on the clotting and proteolytic activities of trypsin and papain, Chatterjee, G. and Sarkar N. K., *Ann. Biochem. exptl. Med.*, 1958, **18** (1), 1.—Heparin or hirudin prevents the coagulation of oxalated plasma by either decalcified trypsin or declacified papain. This inhibition can be reversed in case of papain only by adding the enzyme in excess, but not in the case of trypsin. 'Versene' inhibits the clotting activity of decalcified trypsin at lower concentrations but at higher concentrations it accelerates the activity to some extent. It inhibits the clotting activity of decalcified papain and the inbition can be reversed after adding increasing amounts of calcium. Heparin, 'versene' or hirudin has individually no effect, under the conditions stated, on the proteolytic properties of papain or trypsin.

Studies on the mechanism of blood coagulation by proteolytic enzymes. Part IV. Determination of the inactivation temperatures of papain and trypsin for their clotting and proteolytic activities, Chatterjee, G. and Sarkar, N. K., *Ann. Biochem. exptl. Med.*, 1958, **18** (1), 7.—Decalcified papain and decalcified trypsin lose their clotting activity when they are heated in solution for 20 minutes at 85°C and 70°C respectively. The proteolytic activities of decalcified papain and decalcified trypsin are lost, under the conditions stated, by heating them in solution at 75°C and 60°C respectively.

Histochemical studies on alkaline phosphatase activity of immunogenic tissue cultured *in vitro*, Chatterjee Jyotirmoy and Gupta, P. S., *Ann. Biochem. exptl. Med.*, 1958, **18**(2), 59–A comparative histochemical study of alkaline phosphatase activity of immunogenic liver tissue in culture with that of normal liver tissue culture has been made. Microphotometric readings, after the author's method, reveal higher stain intensity in immunized liver tissue as compared to corresponding normal, the difference being statistically significant. The increase in alkaline phosphatase activity in immunogenic tissue may be ascribed to antibody-protein-synthesis and rapid cellular proliferation.

Studies on total serum protein and its fractions and their seasonal and other variations amongst the residents of Assam, by Banerjee, B., *Ann. Biochem. exptl. Med.*, 1958, **18** (2), 63.—Batches of male and female subjects of different age-groups and economic status and group of Indian soldiers were investigated to find the average values of total serum protein, albumin and globulin and to note the seasonal variations and other peculiarities. The following observations were made: In summer, male (civilian) subjects in the age-group 18 to 24 years showed the highest values of total serum protein, albumin and globulin. The values were 7.12, 4.49 and 2.74 per cent respectively though their net calorie and total protein intake were less than those of the army personnel. There was no statistically significant difference in the total serum protein content of male and female subjects in the age-group 18 to 24 years. There was however statistically significant difference in the total serum protein values as between soldiers and officers, and soldiers and skilled labourers.

FISH

Problems in fish transport and preservation in India, by Bose, A. N., *J. Proc. Inst. Chem.*, 1958, **30** (Part I), 28.—Fish is abundantly available in India and as its protein is of high biological value, it is a first-rate article of food. Fish is one of the most perishable of food-stuffs, the spoilage being due to autolysis, oxidation and bacterial attack. Bacteria are the most important cause of fish spoilage on account of which changes in appearance, flavour and texture appear. Several species of bacteria of the water-soil type are found to cause the spoilage of marine, in-shore sea-water, and fresh water fish. Bacterial spoilage brings about chemical changes, such as reduction of trimethyl amine oxide to amine base coupled with oxidation of lactic acid and sugar, degradation of proteins and initial increase in the total volatile nitrogen. To prevent these changes due to spoilage, the bacterial load should be suppressed by freezing the fish rapidly in ice of refrigerated brine. The cost of such a treatment is very high in India, particularly in summer when the temperatures are high. Mechanically refrigerated transport and properly insulated containers should, therefore, be used in the fish trade in order to reduce the melting of ice to the minimum. Addition of bacteriostatic chemicals to the ice or treating the fish with the chemical followed by holding in ice, increases the storage life of the product. Benzoic acid, sodium nitrite and hydroxylamine have been used with some success with marine fish. Ice containing 1.0 per cent sodium chloride and 0.1 per cent sodium nitrite considerably extends the storage life of fresh water fish. Addition of 1-4 p.p.m. of chlortetracyline to ice, or dipping the fish in the antibiotic solution (10 p.p.m.) followed by holding in ice, and use of CO_2 atmosphere (above 50 per cent) are found to check the growth of bacteria. Ethylene and propylene oxides also have inhibitory effect on the bacteria. They, however, produce oxidative rancidity in treated fish and tend to denature muscle proteins. The A. has stressed in this review the need for investigations on the spoilage bacteria associated with tropical fish and their control, treatment of ice with chemicals for short-time preservation of fish, and development of proper economic containers for transport, which protect the fish from physical injury, at the same time acting as heat insulator.

K.L.R.

FRUIT AND VEGETABLE PRODUCTS

Improved method for the preparation of dehydrated mango pulp, by Rao, P. S. and Dang, R. L., *Res. & Ind.*, 1958, **3** (8), 208.—The manufacture of *ampapar* (dehydrated mango pulp) is at present carried out on a cottage scale by the traditional method which is slow and unhygienic. In view of the favourable internal and export market for *ampapar* of good quality, an improved method for the preparation of the product under hygienic conditions has been worked out. The method consists in the dehydration of mango pulp to a paste in a double-drum drier, conversion of the paste into sheets in an air oven and fusion of the sheets into slabs with the help of aqueous glucose under mild pressure.

The cost per lb. of *ampapar* by this method works out to Rs 1.20 (price of mangoes, Rs 5 per md.)

Some technological aspects of processing of green peas, by (Mrs) Susan Samuel, Pruthi, J. S. and Girdhari Lal, *Indian Food Packer*, 1958, **12** (2), 7 and **12** (3), 9. —This is a review article covering many phases of the technological aspects of processing of green peas. A brief description of varieties suitable for canning, harvesting of peas, methods available for determining the degree of maturity, shelling, yield of peas, cleaning, size grading, quality grading, blanching of peas and its role in enzyme inactivation and effect of various methods of blanching on the retention of nutrients, use of sodium hexametaphosphate in blanching, brining, sterilization, effect of processing on nutritive value, retention of colour of the green peas in the canned product and use of certain chemicals which would maintain the green colour in the green product under prescribed conditions, use of dye stuffs in the colouring of peas, have been discussed. A short account of the causes of cloudiness and gelatinization of brine, microbiological aspects, use of antibiotics in controlling spoilage organisms, standards prescribed by U.S.A. Federal Food Drug and Cosmetic Act, quality control, and under the heading 'recent work' is mentioned the use of maturometer for predicting the exact time at which peas should be harvested for canning. It contains 108 references.

L.N.S.

MICROBIOLOGY

Non-availability of inorganic nutrients in agar media to micro-organisms, by Iswaran, V., *J. sci. industr. Res.*, 1958, **17 C** (9), 140.—The availability of inorganic nutrients such as sodium chloride, magnesium sulphate and potassium hydrogen phosphate contained in agar media for the micro-organisms growing on it has been investigated by estimating the amounts of the salts released from frozen agar gel on thawing.

These studies have revealed that all the nutrient in the agar medium is not available for micro-organisms growing on it and the amount actually released on thawing does not represent the amount that is available for the organisms but is far in excess of what is required by them. This is confirmed by the paucity of growth of *Azotobacter* in liquid media having the same concentration of sodium chloride as the agar medium. This indicates that much larger concentrations of nutrients can be employed in agar media than in liquid media for the growth of micro-organisms.

OILS AND FATS

Some less known oils for the edible fat industry, by Bhattacharya, S., Chakrabarthy, M. K. and Chakrabarthy, M. M., *J. Proc. Inst. Chem.*, 1958, **30** (Part I), 32.—The vanaspati industry in India is mostly using groundnut oil thus greatly affecting the export market the oil used to have. There is an acute shortage of groundnut oil because of the fact that the acreage under groundnut cannot be increased in view of the difficult food situation. The AA have in this paper shown the possibility of utilizing less known oilseeds and oils keeping in view the availability of these sources. The physical characteristics and fatty acid composition of oils from 15 different sources have been given in a table. The oils of *kapok*, jute seed, neem, *karanja*, safflower, niger seed, tobacco seed, rice bran, *nahar*, argemon seed, tea seed, *sal*, *domba*, maize and sunflower seed have been selected and their extent of availability has been discussed. Kapok, jute seed, rice bran, tobacco seed and maize oils seem to offer distinct possibilities of collection and development. The possibilities of using the other oils for hydrogenation have also been discussed.

K.L.R.

GENERAL

Studies in carbohydrates, Part VIII. Structure of swietenose, by Ingle, T. R., and Bhide, B. V., *J. Indian chem. Soc.*, 1958, **35** (7), 516. —Swietenose, a new digalactoside, obtained from Gum Mokha, has been further purified to a white hygroscopic powder. The crude digalactoside has been methylated. The methylated product on vacuum distillation furnishes octa-*O*-methyl-digalactoside (m.p.130-31°; $(\alpha)_D$ + 130.9°) which on hydrolysis affords an equimolecular mixture of 2:3:4:6:tetra—and 2:3:4-tri-O-methyl-d-galactoses. The structure of the digalactoside has been suggested from periodate oxidation as 6-O-alpha-galactopyrauosido-d.galactoside.

PART III (Foreign)

ANALYTICAL

Determination of the peroxide value of edible fats by colorimetric iodometric procedures, by Swoboda, P. A. T. and Lea, C. H., *Chem. and Ind.*, 1958, No. 33, 1090. —Colorimetric versions of the iodometric method for the determination of peroxide values has been described in this paper. The method is particularly useful when the quantity of fat available or its peroxide value is too small for the usual titration with thiosulphate. The method consists in taking the fat sample in acetic-acid-chloroform deaerating with carbon dioxide, addition of potassium iodide solution and closing the tube under a slight positive pressure of carbon dioxide. The tube is left in the dark for one hour after which aqueous cadmium acetate solution is added to the reaction mixture. The test tube is closed by a glass stopper shaken for 15 seconds and then centrifuged. The extinction at 350 mμ. of the supernatant aqueous phase is measured by means of a spectrophotometer. Alternately, 1 ml. of 10 per cent aqueous starch-urea solution is also added along with cadmium acetate solution to the reaction mixture. After shaking and centrifuging, the blue colour of the starch-iodine complex is measured at 550 mμ. in a grating or filter absorptiometer if a spectrophotometer is not available. The peroxide vlaue of the fat sample is calculated from the calibration curve. The details of the method are given. Both the methods have been tried with purified samples of benzoyl peroxide, lauroyl peroxide and *tert*-butyl hydroxide. The results obtained were within 2 per cent of the theoretical values. The peroxide values of 1-50 mg. samples of lard, cottonseed oil, groundnut oil and egg phospholipid obtained by the colorimetric methods were in close agreement with those obtained by the usual volumetric method on 0.1—1 g. samples.

K.L.R.

Use of Dowex-50 to separate interfering ions in the determination of magnesium in soil extracts by titan yellow, by Tobia, S. K. and Milad, N. E., *J. agric. Fd. Chem.*, 1958, **6** (5), 358.—A simple and rapid separation of magnesium from interfering ions has been attained by using a single column of the cation exchanger, Dowex 50, in the potassium form. The anions, iron, aluminium, and most of the manganese are first separated by treating the solution with 5 per cent ammonium citrate at pH 7 and passing it through the column. Magnesium is then separated from calcium by chromatographic elution with 0.025 M citrate solution at pH 7.5. A modified method for the direct determination of magnesium by Titan yellow in the eluates is described.

Test paper for detecting peroxidase, by Morris, H. J., *J. agric. Fd. chem.*, 1958, **6** (5), 383.—A procedure is described for preparing test papers for detecting peroxidase. Qualitative tests for peroxidase are made by merely moistening the paper with the solution to be tested. Stability of the paper is greatly increased by storage at very low humidity under refrigeration.

ANTIOXIDANTS

Protection of cooked meats with phosphates, by Tims, M. J. and Watts, B. M., *Food Technol.*, 1958, **12** (5), 240.—Oxidative rancidity in cooked meat products has been measured by the 2-thiobarbituric acid reagent. Rancidity occurred in all meats tested and was not limited to those containing many polyunsaturated fatty acids. T.B.A. values surpassed the limit of acceptability within a few hours after cooking, but such increases were not observed in raw meat.

The antioxidant effect of several phosphate salts was studied. Pyro-, tripoly-, and hexametaphosphates had a protective effect whereas orthophosphate did not. Ascorbic acid acted synergistically with phosphates to protect against rancidity in meats. All phosphates decreased cooking losses.

BACTERIOLOGY

Simultaneous determination of total count and fluorescent pseudomonads in fresh meat and poultry, by Silliker, J. H., Shank, J. L. and Andrews, H. P., *Food Technol.*, 1958, **12** (5), 255.—The normal spoilage of fresh meats, poultry, and fish is due primarily to the growth of *Pseudomonas* and *Achromobacter* genera. The identification of these organisms has, in the past, been based on cultural and morphological studies made on individual isolates. Since pseudomonads are so intimately associated with the spoilage of fresh meat, poultry and fish, a method for the direct enumeration has great value in assessing the bacteriological condition of such products. This article describes a method whereby it is possible to determine simultaneously the total bacterial count and the numbers of pseudomonads.

BAKERY

Organic acids and esters produced in pre-ferments by Johnson, J. A., Miller, B. S. and Curnutte B., *J. agric. Fd. Chem.*, 1958, **6** (5), 384.—Quantitative analysis of organic acids and esters in liquid preferments used in new method of breadmaking was studied using chromatographic techniques. Three organic acids—acetic, lactic, and an unidentified acid—increased significantly during fermentation of the pre-ferment. The concentration of acids after 24 hours of fermentation caused the development of slight stickiness of the dough associated with the swelling of the gluten proteins. Other physical properties of the dough were not affected. Ethyl lactate was not detected but ethyl acetate reached a maximum concentration after 8 hours of fermentation. The acids or esters produced in the liquid pre-ferment in 8 to 24 hours had little detectable effect on the bread flavour.

BIOCHEMISTRY AND NUTRITION

Lysinse supplementation of a breakfast cereal and milk combination, by Thiessen, R. (Jr.) and Reussner, G. H. (Jr.), *J. agric. Fd. chem.*, 1958, **6** (5), 377.—Cereal proteins in such sources as wheat flour and bread have been improved considerably in protein quality with supplements of synthetic lysine. This investigation was made to determine whether a positive growth response would be obtained from the addition of 0.5 per cent DL-lysine hydrochloride to a wheat flakes breakfast cereal with and without the milk used in a customary serving. A 4-week feeding test indicated that the lysine supplement gave a growth response when wheat flakes were fed without milk—no significant increases in growth or protein efficiency were noted with milk.

The nutritive value of fresh and roasted, Californian-grown nonpareil almonds, by Hall, A. P. *et al.*, *J. agric. Fd. chem.*, 1958, **6** (5), 377.—The effect of blanching and of dry-oven roasting on the proximate composition, protein quality, calcium, phosphorus, iron, thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, folic acid, and biotin in California almonds of the Nonpareil variety was determined. The removal of the skins by the blanching process did not produce significant change in any of the nutrients measured, except for calcium and iron, which appear in greater amounts in the skin. Dry-oven roasting resulted in 69 per cent loss of thiamine and 23 per cent loss of pantothenic acid. There was additional loss of 15 per cent thiamine and 19 per cent of pantothenic acid as a result of oil roasting. There was insignificant change in the other vitamins as a result of either type of roasting.

Studies on corn proteins: IV. Protein and amino acid content of different corn varieties, by Bressani, R. and Mertz, E. T., *Cereal Chem.*, 1958, **35** (3), 227.—No major differences in amino acid composition were observed between several U.S. and Guatemalan corn (*Zea mays*) selections. The per cent of total nitrogen of the grain contributed by the pericarp plus tip can varied from 1.8 in U.S. High Protein (HP) to 3.3. in U.S. 4251; the per cent contributed by the endosperm varied from 68.4 in U.S.: High Oil (HO) to 83.2 in U.S. High Protein (H5); the per cent contributed by the germ varied from 14.6 in U.S. High Protein (H5) to 29.2 in U.S. High Oil (HO). The Guatemalan selections had intermediate values.

The proteins of the germ and endosperm of the U.S. and Guatemalan selections were extracted with an alkaline copper reagent and the extracts separated into three fractions by a method described previously. In the endosperm samples, the acid-soluble proteins varied from 17 to 26% of the alkali-and alcohol-soluble proteins (zein) from 41 to 60 per cent, and the alkali-soluble, alcohol-insoluble proteins (glutelins) from 17 to 31 per cent of the total nitrogen. Similar treatment of the corn germs gave 30-40 per cent acid-soluble, 5-10 per cent alkali- and alcohol-soluble, and 49-54 per cent alkali-soluble, alcohol-insoluble proteins as a per cent of the total nitrogen. The copper extraction-fractionation method should prove useful to the corn breeder in the development of new types of corn.

CEREALS

Lysine content of wheat varieties, species, and related genera, by Lawrence, J. M., *et al.*, *Cereal Chem.*, 1958, **35** (3), 169.—Microbiological assays for lysine were carried out on 286 samples representing a broad spectrum of wheat varieties and species, related genera, and hybrids. Wheat varieties varied from a minimum of 2.46 per cent lysine in the protein to a maximum of 3.84. Still wider variations were found among the samples of other *Triticum* species and related genera. Certain samples in each classification had proteins with a lysine content enough higher than the mean to give reason to hope that breeding wheats of consistently increased lysine content may prove to be possible.

There were no significant differences in lysine content among white spring wheats, red spring wheats, and winter wheats. The over-all mean lysine content on a unit protein basis was 2.89 per cent for wheats of about 13.5 per cent or more protein, but below this level there was a highly significant inverse relationship between protein content and lysine in the protein. The lysine content was not affected by the year of growth, nor by the location, except as these affect the total protein level.

Mean values for per cent lysine in the protein for other groupings were, for 6 varieties of durum wheat, 2.97; for 18 samples of other *Triticum* species, 3.00; for 13 samples of genera related to wheat, 3.30; and for 15 hybrid selections of crosses of *Agropyron elongatum* with wheat, 3.10.

Changes in the solubility of corn protein resulting from the artificial drying of high-moisture corn, by McGuire, T. A. and Earle, F. R., *Cereal Chem.*, 1958, **35** (3), 179.—The solubility of proteins in water and in 0.01N potassium hydroxide solution at 75°±5° F. (23.9°±2.8° C.) decreased more or less continuously with increasing drying temperatures ranging from 120° to 200°F. (48.9° to 93.3°C.); no indication was given of any critical damage occurring at any particular temperature. Some solubility measurements carried out with trichloroacetic acid and Duponol-C gave a similar but less conclusive relationship with drying temperatures.

FISH

Problems in determining fish freshness, by Stansby, M. E., *et al.*, *Food Technol.*, 1958, **12** (5), 260.—Spoilage of fish is a complex process that can proceed along many diverse lines. The pattern followed is dependent upon various factors many of which are correlated with handling methods. Even different batches of the same species of fish will spoil in quite different ways.

No one freshness test possibly can give a good measure of the relative freshness of fish. Any one freshness test should be patterned toward some specific objective such as (*a*) measurement of loss of normal flavour, (*b*) measurement of development of off flavour and odour. (*c*) estimation of keeping quality, or (*d*) estimation of time since the fish were caught.

FRUIT AND VEGETABLES

Continuous jelly manufacture, by Ponting, J. D., Sanshuck, D. W. and Brekke, J. E., *Food Technol.*, 1958, **12** (5), 255.—A process is described for making jellies continuously from fruit juice concentrates. This process consists in mixing metered streams of sugar sirup, pectin solution, and fruit juice concentrate. Only the sugar sirup is heated to a high temperature, therefore the fruit flavour and colour are preserved by protection from heat damage. Jellies made by the continous process retain the quality of the fruit juice concentrate used.

INSECTICIDES

Biological activity of several o, o-dialkyl alpha-acyloxyethyl phosphonates, by Arthur, B. W. and Casida, J. E., *J. agric. Fd. Chem* 1958, **6** (5), 360.—Knowledge of the mechanism of selective toxicity of insecticides is valuable in determining their safety in use and in developing new chemicals. Several o, o-dialkyl 2, 2, 2-trichloro-1-acyloxyethyl phosphonates and related derivatives were compared as to toxicity and anticholinesterase activity. o, o-dimethyl 2, 2, 2-trichloro-1-n-butyryloxyethyl phosphonate was most selectively toxic to houseflies of all the phosphonates studied. In vivo and in vitro metabolism studies with insects and rats showed that this phosphonate was hydrolyzed at the acyl group, the phosphorus-carbon bond, and possibly the phosphorus-oxygen-methyl bond. The initial site of in vivo hydrolysis appeared to be a major factor in the selective toxicity of this compound.

MEAT

Factors affecting quality of prepackaged meat: IV. Microbiological studies. A. Cultural Studies on bacterial flora of fresh meat; classification by genera, by Halleck, F. E., Ball, C. O. and Stier, E. F., *Food Technol.*, 1958, **12** (5), 197.—Two groups of bacteria predominated the flora of fresh meats during a four-week storage period at 34-38 F. Morphological growth characteristics of *Achromobacter-Pseudomonas* and lactobacillus colonies on the surface and in the sub-surface of a culture medium were sufficiently distinct to make possible the differentiation of the genera from each other in a mixed culture by inspection. During the first 2 weeks lactobacilli and non-pigmented organisms of the *Achromobacter-Pseudomonas* type predominated; in the later part of the storage period the *Pseudomonas fluorescens* type became dominant.

Non-pigmented *Achromobacter-Pseudomonas* constituted about 85 per cent of the population during the first 2 weeks of storge at 34-38°F, and during the first week at 40-44°F. During the entire period lactobacilli accounted for about 5 per cent of the population. Bacteria of the *Pseudomonas fluorescens* type constituted approximately 80 per cent of the total count in the later part of the storage period. In the early part they seldom exceeded 5 per cent of the population. Packaging materials did not selectively affect rates of growth of the predominant genera.

Use of selective media to determine bacterial population shifts was unsatisfactory since the flora itself was selective. A significant mathematical correlation was found between total bacteria counts and counts obtained from the selective media. Thus, rate of increase in number of bacterial cells, which produced oxidase or lipase, or liquefied gelatin, was co-ordinate with the rate of increase in the total counts.

The effect of various additives on the stability of cured hams, by Mullins, A. M., Kelley, G. G. and Brady, D. E., *Food Technol.*, 1958, **12** (5), 227.—Adding sodium ascorbate and/or sodium hexametaphosphate or calcium lactate-lactic acid mixture did not result in any marked improvement in cure penetration or uniformity in colour as judged by the University of Missouri meat section staff. The [illegible] periphery of the *semimembranosus* and *semitendinosus* muscles were generally lighter in colour than the remaining portion of the center ham slice. Hams injected with hot were slightly more uniform in colour than paired hams injected after being chilled.

Sodium ascorbate and /or sodium hexametaphosphate were not beneficial in preventing discoloration when these ingredients were incorporated into the curing mixture. No residual ascorbate was present in the treated hams at the end of the curing and heating process. Discoloration was delayed considerably when ham slices were sprayed with a 5 per cent solution of sodium ascorbate or when dipped in a solution of sodium ascorbate-nitrite mixture.

There was no appreciable difference in palatability factors *i.e.*, saltiness, flavour, juiciness, or tenderness—in the treated hams as compared to the commercially cured or control hams as judged by the panel. Commercially cured hams and control hams ranked slightly lower on all the palatability factors except tenderness, but there was not enough difference between any of the treatments to be significant statistically.

Chlortetracycline for preserving gulf oysters, by Novak, A. F., Fieger, E. A. and Bailey, M. E., *Food Technol.*, 1958, **12** (5), 237.—Use of 20 p.p.m. C.T.C. has merit as a preserving agent that outweighs cost for processing Gulf Oysters prior to iced or frozen storage. No disagreeable qualities appeared to develop because of inclusion of C.T C. Under these circumstances the employment of C.T.C. might be considered beneficial as it maintains consumer acceptance of the product by preventing the development of undesirable physical qualities. It is effective in low concentrations.

Effectiveness of commercial papain in meat tenderization, by Weiner, S., *et al.*, *Food Technol.*, 1958, **12** (5), 248.—The proteolytic activity of 4 pure papains and 14 tenderizers containing papain is reported. Both milk clotting and beef digestion methods were used. The linear relationship which had been reported between the reciprocal of milk clotting time and enzyme concentration was shown to exist under the conditions of this experiment for both pure papains and meat tenderizers. Likewise, as temperature increased the activity increased, but not enough work was done to define the relationship.

The milk clotting test was used as a standard method of assay to evaluate the beef digestion method. With the concentrations used, the milk clotting and beef digestion methods were found to give similar estimates of proteolytic activity. The activity of the tenderizers ranged from none to approximately 3 per cent of the activity of the reference papain when tested at 40° C. The relative activity of the tenderizers was increased at higher temperatures. However, powdered tenderizers were found to have a higher activity than most liquid tenderizers by both the milk clotting and beef digestion methods. Two modifications of the beef slurry substrate were tested but did not give more reproducible results than the slurry, although one modification was more convenient to use. Although additional work needs to be done on development of a reproducible meat substrate, it seems possible that the beef digestion method could be adapted for the study of enzymatic activity and beef tenderization. It is pointed out that there is not necessarily any relationship between the milk clotting test, the beef digestion method, and tenderness improvement as measured organoleptically. It is possible that tenderization may occur before the proteolytic effect is measurable.

MICROBIOLOGY

Effect of selected antibiotics on Pseudomonas fluorescens, Pseudomonas fragi and Pseudomonas putrefaciens, by Heather, C. D. and Vanderztan, C., *Food Technol.*, 1958, **12** (5), 263.—The AA have studied the effect of nine antibiotics *viz.*, oxytetracycline, chlorotetracycline, tetracycline, dihydrostreptomycin, chloramphenicol, polymyxin B, penicillin, carbomycin and bacitracin towards seven cultures of *P. fluorescens* and ten cultures of *P. fragi* and *P. putrefaciens* grown on slants of plate count agar. The concentration of the antibiotics tried varied from 0.39 to 100 μg. per ml. of the reaction mixture. The minimum inhibitory and lethal concentrations of the antibiotics effective against the organisms were determined in nutrient broth as well as milk. The results showed that penicillin had no inhibitory effect on any of the test species. Carbomycin and bacitracin also had no effect on *P. fragi* and *P. fluorescens*. The three tetracycline antibiotics produced a better inhibitory effect than the other antibiotics. Chloramphenicol and polymyxin B showed greater inhibition towards *P. putrefaciens* than to *P. fragi* and *P. fluorescens* at the concentration studied. Chloramphenicol did not inhibit the growth of *P. fluorescens*. Different strains of the same species exhibited differences in the sensitivity to the various antibiotics. The minimum inhibitory concentration of the antibiotics for the various strains of the test organisms were found to be considerably higher in milk than in nutrient broth. The minimum lethal concentration of penicillin, carbomycin, bacitracin, chloramphenicol, polymyxin and dihydrostreptomycin exceeded the highest level tested (100 μg/ml.). With other antibiotics, an average of about 16 times the concentration needed for inhibition in nutrient broth was required to produce a lethal effect. The same value in milk exceeded 100 μg/ml.

K.L.R.

The selectivity of anethol and thymol media for lactic acid bacteria, by Marthinsen, R.M. and Vaughn, R. H., *Food Res.*, 1958, **23** (2), 155.—The use of anethol and thymol in basal media of glucose, tryptone medium and liver infusion either as broth or with agar to favour the growth of the lactic acid bacteria and to inhibit the growth of all other micro-organisms has been examined. 108 different cultures including 2 genera of actinomycetes, 15 genera of bacteria 15 genera of molds and 6 genera of yeasts were used as test organisms. The selective inhibition of both anethol and thymol was found to be dependent upon their concentration. It was also found to increase with a decrease in the pH of the medium. Anethol and thymol were found to be more effective in preventing the growth of molds and yeast than bacteria, provided their concentrations were not too inhibitory for the lactic acid bacteria. This would suggest their restricted use as selective agents under conditions where populations of the lactic acid bacteria would be predominant.

B.V.S.

A direct surface agar plate laboratory method for quantitatively detecting bacterial contamination on non-porous surfaces by Angelotti, R., and Foter, M. J., *Food Res.*, 1958, **23** (2), 170.—Details of a direct surface agar plate (D.S.A.P.) method by which a quantitative determination of the bacterial contamination on non-porous surfaces are given. This method is also compared with the conventional plate count technique. The D.S.A.P. method is found to be capable of detecting in 95 out of 100, 88.5 to 99.3 per cent of the spore contamination on non-porous surfaces. It is pointed out that this method, which, at present, is limited to flat and non-porous surfaces and which may be complicated for routine practical applications, is advantageous in the sense that determinations can be made *in situ*.

B.V.S.

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PACKAGING WHEAT FLOUR IN LAMINATED JUTE BAGS

By N. V. R. Iyengar, M. V. Sharangapani and S. V. Pingale

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Wheat flour produced in the mills in India is at present being filled in jute bags and transported to distant centres for consumption. The jute bag as a container has an inherent drawback namely, that it does not afford any protection against external dirt, changes in the climatic condition *e.g.*, moisture and depredations of insects. Also spillage through the seams is relatively high in jute bags. In our field studies this has been estimated to be about one pound. Moreover, when the bag full of flour is emptied, the last few pounds are contaminated with jute fibre, dirt, etc. which render it not useful for bakeries as such.

Earlier work[1, 2, 3] has shown that insect damages could be effectively checked by impregnation of jute bags with insecticides. This method, however, did not prove useful for the flour-bags since the flour, seeping through the pores of the bag, masks the impregnated insecticide film[4]. Lamination of the jute bag as a barrier to insects and moisture and also to prevent seepage was therefore thought of and the results of the studies carried out on two types of laminations are described in this paper.

FOOD SCIENCE **DECEMBER 1958**

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Experimental

Materials: The experimental bags were made of size 12″ × 12″ from 'B-twill' jute fabric. Polyethylene film of 150 and 200 gauge and union kraft-paper were individually used for lamination. In the first series of experiments bags of polyethylene and kraft-paper were fitted in the jute bag to resemble a laminated bag. Later, commercially available laminated jute fabric (B-twill) was employed for the preparation of bags. Commercially laminated containers were easy to handle but otherwise no significant difference could be observed in the results between laboratory and commercially laminated bags. Freshly milled whole-meal wheat flour in equilibrium with 50 per cent relative humidity at 26°C was the test material. Insects used were obtained from laboratory cultures and ranged in age between 15 and 20 days.

Methods: The bags were filled to capacity with flour and stitched with jute twine. In the laminated bags the extra top length of lamination was tucked inside before stitching. The moisture up-take stored in different bags was determined by placing the bags in chambers (3′ × 3′ × 2′) wherein the relative humidity (R.H.) and temperatures were controlled. The R.H. was adjusted a week prior to placing the bags in the chambers by keeping sufficient quantities of sulphuric acid adjusted to required strength[5]. The chambers were placed in controlled temperature rooms.

Moisture content of the flour samples was determined on an electrical moisture-meter (Marconi meter). Insect penetration was studied in two different ways viz., (*i*) by introducing 50 adults each of *Calandra oryzae L.* and *Tribolium castaneum* Hub., in the bags before closing them, and (*ii*) by placing the closed bags in a chamber heavily infested by these insects. Insect population from each bag was assessed once in 15 days.

TABLE I. *Sorption and desorption of moisture by wheat flour stored in jute and laminated jute bags for a period of* [illegible]

Relative humidity	Temp. °C	Mean values of sorption % for				Mean values of desorption % for			
		Jute	Kraft paper jute	Poly (150) jute	Poly (200) jute	Jute	Kraft paper jute	Poly (150) jute	Poly (20 jute
50%	26	0.30	0.0	0.042	0.022	2.58	0.24	1.02	[illegible]
	20	0.154	0.0	0.030	0.012	2.20	0.16	0.86	[illegible]
70%	26	1.0	0.12	0.54	0.36	0.56	0.00	0.64	[illegible]
	20	0.82	0.10	0.40	0.22	0.42	0.00	0.048	[illegible]
90%	26	7.84	0.58	3.62	3.04	...	...	...	...
	20	5.92	0.32	2.94	2.22	...	...	...	...

All values are means of 5 estimations. Desorption rate is calculated for the flour in equilibrium with 90% Relative Humidity.

TABLE II. *Acidity of fat in flour stored in different bags under controlled humidities at 26 C for 30 days.*

Relative humidity	Initial condition of flour	Mean fat acidity value (mg. KOH/100 gms. material)					
		Jute	Kraft paper jute	Poly (150) jute	Poly (200) jute	Kraft paper bag	150 gauge Poly bag
50%	Insect free	56.2	58.0	53.8	54.0	56.8	53.2
50%	Infested with 100 adults of Calandra	94.6	113.6	103.4	108.2	116.2	110.4
50%	Infested with 100 adults of Tribolium	108.0	125.4	115.2	117.8	122.4	115.0
70%	Insect free	72.6	58.4	64.8	62.6	57.8	64.0
70%	Infested with 100 adults of Calandra	153.4	117.4	138.2	129.4	116.8	140.4
70%	Infested with 100 adults of Tribolium	176.2	127.8	156.8	145.00	128.0	152.2

All values are means of 5 estimations. The flour used was in equilibrium with 50% R.H. at 26 C with 52.0 mg. KOH/100 gms. flour as the initial acidity of fat.

Acidity of fat was determined by the methods of the A.O.A.C. [6], to know the extent of spoilage caused by either moisture or insects. The effect of moisture and insects on fat acidity has been demonstrated earlier. [7,8].

Results and Discussion

Sorption and desorption of moisture by flour packaged in different bags are shown in Table I.

The flour stored in the bags was in equilibrium with 50 per cent R.H. and therefore no loss or gain is recorded at this level of humidity. It is seen from the results that the rate of sorption is greater than that of desorption in the polyethylene laminated bags. In the kraft-paper laminated bags neither sorption nor desorption is noticed. It is therefore indicated that the flour to be stored in laminated bags should have low level of moisture. Fat acidity which can affect the quality of flour might develop at a relatively faster rate in the laminated bags when the initial moisture in the stored flour is high (*vide* Table II).

Insect population studies are shown in Table III. It was seen that *T. castaneum* is able to penetrate outwards through both polyethylene and kraft-laminated bags but could not pierce through from outside whereas *Calandra* was able to move both ways. Ordinarily *Calandra* is not

TABLE III. *Mean insect population in wheat flour stored in different bags at 50% R. H. and 26 C.*

Initial insect population	Place of Storage	Running insect infestation at the end of 4 months in: Jute bag		Kraft paper bag		Poly (150) bag		Kraft paper jute bag		Poly (150) jute bag		Poly (200) jute bag	
		Cal	Tri	Cal	Tri	Cal	Tri	Cal	Tri	Cal	Tri	Cal	Tri
Insect free	Infested with adults of Calandra and Tribolium	101.4	343.4	78.6	112.4	84.8	212.4	54.2	74.4	76.8	172.4	59.2	144.0
Insect free	Infested with adults of Tribolium	...	425.8	...	...	...	28.2	...	...	...	42.0	...	...
Insect free	Infested with adults of Calandra	78.6	...	87.4	...	112.4	...	92.4	...	104.0	58.4	...	...
Infested with 100 adults of Tribolium	Insect free	...	247.6	...	458.4	...	387.4	...	400.4	...	267.4	...	327.8
Infested with 100 adults of Calandra	Insect free	29.4	...	54.2	...	49.4	...	39.6	...	61.6	...	72.4	...

TABLE IV. *Insect populations* in wheat flour stored in jute and laminated jute bags for four months at 50% R.H. and 26°C*

Description of container	C. oryzae	T. castaenium	Oryzaephilus surinamensis	Rhizopertha dominica	Latheticus oryzae	Ephestia cautella	Psytodrepa paniceum
Jute bag not impregnated	28.6	263.8	460.0	172.6	12.6	27.2	11.4
Jute bag impregnated	3.2	102.0	752.8	...	...	5.4	...
Kraft paper laminated jute bag impregnated	...	...	...	...	...	...	...
Polyethylene 150 laminated jute bag impregnated	...	...	...	...	...	...	...
Polyethylene 200 laminated jute bag impregnated	...	...	...	...	...	...	...
Kraft paper laminated jute bag not impregnated	17.4	86.8	272.4	242.0	17.8	29.2	10.4
Polyethylene 150 laminated jute bag not impregnated	29.4	112.8	329.2	350.4	8.4	20.0	5.2

* Mean population per bag.

a pest of wheat flour. However, the holes caused by it make way for other insects like *Tribolium* which by themselves cannot make their way through the lamination from outside. The puncturing of lamination by insects can expose the flour to the same depredations as in bags without laminations.

It is also noticed that the build-up of insect population in the laminated bags is relatively more. It is possible that the undisturbed conditions produced due to limited insect movement in the laminated bags might have led to greater breeding of insects.

In the laminated bags seepage of flour is reduced considerably. Further the laminated bags could be emptied completely without the fear of obtaining flour contaminated with extraneous matter at the end. In commercial jute bags, ordinarily 1-1½ lbs. of the flour removed at the end is full of jute fibre and dust. Lamination might also check quick changes in the quality of the flour brought about by rapid egress or ingress of moisture due to varying climatic conditions. The laminated bags tested however, though satisfactory in other respects, were not insect proof. Insect penetration could also deprive the bags of other advantages. This led to reconsideration of the value of impregnation on the laminated bags. An experiment was therefore run through, in which jute bags were impregnated according to the process described by Majumder and Pingale[9] and either the polyethylene or kraft-paper bags were pushed inside. After filling with flour these bags were placed in chambers infested with the above mentioned two insects and *Oryzaephilus surinamensis F*, *Rhizopertha dominica F.*, *Latheticus oryzae* wat., *Ephestia cautella* Walker and *Psytodrepa paniceum*. As can be seen from Table IV, impregnated laminated bags completely protected the flour from insect attacks. The experiment in this case was run for a period of 4 months during which complete protection was obtained. Ordinarily, flour may not be stored beyond 4 months.

In the above experiments both polyethylene and kraft-paper-laminations have yielded similar results in respect of insect penetration. With regard to water vapour permeability kraft-paper does not allow any change and this could lead to development of greater rancidity. Polyethylene lamination therefore appears better. Amongst the two films of polyethylene tested, 150 gauge film may be preferred on account of cost and weight. When jute fabric is to be laminated, if it is impregnated, the insect penetration is avoided with necessary advantage.

An argument in favour of jute bags, at present in use, for the storage of flour may be that they can be used repeatedly. By keeping an extra length of polyethylene at the top, without lamination, it may be possible to use the laminated bags also a number of times.

Conclusion

At present a superior grade jute fabric is being used for making bags suitable for storing wheat flour. The same object could be achieved by using coarser fabric laminated with polyethylene film. Such a combination may not be more expensive than the bags currently in use. The lamination has the added advantages of preventing seepage of flour, quick changes in moisture content and contamination of flour with extraneous material. Further, by impregnation such bags could be rendered insect-proof in the storage of flour, whereas this is not possible in the conventional jute bags.

Similar problems might be encountered in the storage of many other products like gram flour, powdered spices and other milled foods.

Acknowledgement

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STUDIES ON THE NON-PROTEIN NITROGENOUS CONSTITUENTS OF THE SEEDS OF LATHYRUS SATIVUS

The consumption of the seeds of Lathyrus genus in large quantities has been known to cause in human beings the syndrome known as lathyrism[1, 2]. The various species of the genus differ in their toxicity and there is also a difference in the response of the various test animals to the different species of *Lathyrus*[3, 4]. The toxicity of the seeds is reported to be due to the presence of toxic substances[3, 4]. The isolation from *Lathyrus odoratus* of beta(N-γ-l-glutamyl) amino propionitrile in a crystalline form, capable of producing skeletal abnormalities and nervous disorders in rats was accomplished by many workers[5-9]. Dasler[8] and Waw Zonek *et al*[9] showed that the toxic portion of the molecule is beta amino propionitrile[4]. The chemical properties of the toxic principle in *L-sylvestris wabnesi* appears to be different from those of γ -glutamyl-beta amino propionitrile[10]. It has also been reported that the toxic factor responsible for causing lathyrism in human beings is water soluble[10-12]. No information, however, is available regarding the chemical nature of toxic compounds present in *Lathyrus sativus* seeds. The present communication deals with studies on the non-protein nitrogenous constituents present in the seeds of *Lathyrus sativus*.

The present investigation was carried out on a genuine sample of *Lathyrus sativus* obtained from the Department of Agriculture, Bhopal, a region where the incidence of lathyrism is fairly common[2]. The seed was powdered to pass through a 60 mesh sieve and the flour was used for the extraction of the non-protein nitrogenous (N.P.N.) constituents. In order to find out the most effective method for obtaining the maximum yield of N.P.N. constituents in the extract, the following extractants were tried. (1) cold and hot 0.2 N NaCl (2) Cold and hot water and (3) cold 50 per cent ethyl alcohol. In all the cases 10 g. of the material were extracted with 100 ml. of the solvent. Extractions with cold solvents were carried out at room temperature (25°-30°C) by shaking the mixture for an hour. Extractions with hot water and saline were carried out at a temperature of 90-100°C for 15 minutes. In the case of saline and water extracts, the proteins were precipitated by the addition of trichloriacetic acid (1 g. of T.C.A. for 20 ml. of the solution) and the extracts were filtered. Preliminary tests showed that 50 per cent alcoholic extract did not contain any material precipitable by T.C.A. The nitrogen contents of the protein-free extracts were determined by microkjeldhal method. The values for N.P.N. extracted by different methods are given in Table I.

TABLE I. *Extraction of non-protein nitrogenous constituents by different methods*

Extractant*		non-protein nitrogen extracted (mg./g. of seed)
1. Hot saline	...	5.3
2. Cold saline	...	5.2
3. Hot water	...	6.0
4. Cold water	...	5.8
5. 50% ethyl alcohol	...	5.7

* All the extracts, except the alcoholic one, were treated with TCA to remove the proteins and the nitrogen estimations were carried out in the filtrate.

The procedure employed for the identification and quantitative determination of amino acids in the 50 per cent alcoholic extracts of *lathyrus sativus* was the same as that described by Krishnamurthy and Swaminathan[13]. For determining the nature of peptides present in the 50 per cent alcoholic extract, the extract was hydrolysed with 6 N. HCl at 15 lbs. pressure for 1 hour and the acid was removed in vacuum. The residue was taken in a known volume of water and used for chromatographic analysis. The results are presented in Table II. In order to identify unknown ninhydrin positive compounds present in the extracts, the required filter paper strips were cut out from a number of chromatograms not developed with ninhydrin, with the help of ninhydrin sprayed guide strips from the same chromatograms. The required substance was extracted from the filter paper strips using 50 per cent alcohol and concentrated to a known volume. Part of the extract was hydrolysed with HCl and the compounds present in both hydrolysed and unhydrolysed extracts were identified chromatographically.

Paper chromatographic analysis for the identification of γ-glutamyl beta amino propionitrile was carried out according to the method of Dupuy and Lee[5].

It will be observed from Table I that 50 per cent alcohol was as efficient as water or saline in extracting N.P.N. of *Lathyrus sativus*. As this solvent has the added advantage that it does not extract proteins, the extract could be used as such for chromatographic analysis.

In the unhydrolysed alcoholic extract of the resting seeds (Table II) arginine, alanine, glutamic acid, valine and leucine were identified. I addition to these, two ninhydrin positive spots were observed. (R_f. values in butanol-acetic acid-water solvent; Spot 1:0.20; Spot 2:0.37), Spot 1 on acid hydrolysis gave rise to lysine and spot 2 gave rise to another ninhydrin positive spot (R_f. value in B.A.W. solvent 0.34) which was not identical with any of the common amino acids. Further work on the identification of this ninhydrin positive spot and the nature of spots 1 and 2 is in progress. Assay of beta-amino propionitrile in the seeds by the method of Dupuy and Lee[5] gave negative results. The recovery of B.A.P.N added to the seed powder was of the order of 95-98 per cent indicating thereby that *Lathyrus sativus* seeds do not contain either free or bound beta-amino-propionitrile.

TABLE II. *Free Amino acids in the N.P.N. extract of Lathyrus sativus seeds. (Amino acid (mg) per gram of the seed)*

Amino acid	Resting seeds	
	U. H.*	H†
Lysine ...	...	0.28
Arginine ...	1.05	1. 1
Aspartic acid ...	...	1.75
Glutamic acid ...	1·05	1.19
Alanine ...	0.26	0.29
Serine ...	...	...
Glycine ...	...	...
Threonine ...	...	...
Tyrosine ...	...	...
Valine ...	0.07	0.08
Leucine ...	0.08	0.08

* U. H. = Unhydrolysed alcoholic extract.

† H. = Acid hydrolysed alcoholic extract.

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NUTRITIVE VALUE OF THE PROTEINS OF COCOANUT MEAL AND A LOW-COST PROTEIN FOOD CONTAINING COCOANUT AND GROUNDNUT MEALS AND BENGAL GRAM (Cicer arietinum)

Dietary surveys carried out in Asian countries, Africa and South America have shown that the diets consumed by the vulnerable groups of the population belonging to low income groups are deficient in proteins[1-3]. Hence it has become a matter of great importance to utilise all available sources of protein for supplementing human diets in order to prevent protein malnutrition[1-5]. Studies on the utilization of peanut, sesame and cottonseed flours have been reported by many workers.[4-9] Comparatively less work has been done on the utilization of cocoanut cake for supplementing human diets. Cocoanut cake is available in large quantities as a by-product of the oil industry in Kerala State and in certain other parts of South India. Swaminathan[10] and others[11, 12] have reported that cocoanut proteins possess a fairly high biological value. Kuppuswamy *et al*[9] and Sadasivan[13] have observed that cocoanut meal when incorporated at 10 per cent and 30 per cent levels exerts a marked supplementary value to poor rice and tapioca diets respectively. Since cocoanut meal has a high fibre content, it is likely to cause digestive troubles when consumed in large quantities. In view of this it was considered desirable to study the possibility of blending edible quality cocoanut meal with other protein foods for supplementing human dietaries. The present communication deals with studies on the protein efficiency ratio of the proteins of edible cocoanut meal and a low cost protein food containing cocoanut meal, low fat groundnut flour and Bengalgram flour.

Edible quality hydraulic press cocoanut cake free from grit and other foreign matter was used in this study. The material was powdered in a disintegrator to pass through 40 mesh sieve and roasted lightly at a low temperature (120° C) for about 5 minutes to develop a pleasant aroma. A low cost protein food was prepared by mixing lightly roasted cocoanut flour (one part), low-fat groundnut flour (two parts) and roasted Bengalgram flour (one part). The proximate principles and minerals of the cocoanut meal and the protein food were determined by A.O.A.C. methods[14]. The results are presented in Table I.

TABLE I. *Chemical composition of cocoanut meal and low-cost protein food*

Constituent	Cocoanut meal	Low-cost protein food*
Moisture % ...	9.2	10.1
Protein % (N × 6.25) ...	20.2	35.1
Fat % (ether extractives)	9.5	8.0
Crude fibre % ...	9.9	2.9
Carbohydrates % (by difference) ...	46.2	39.7
Ash % ...	5.0	4.2
Calcium (mg) % ...	28.0	70.0
Phosphorus (mg) % ...	443.0	454.0

* A blend of low fat cocoanut meal (one part), low fat groundnut meal (two parts) and roasted Bengalgram dhal flour (one part).

The protein efficiency ratio of the two materials as compared with that of skim milk powder was determined by the rat growth method of Osborne, Mendel and Ferry[15] as described by Swaminathan[16]. Three groups of freshly weaned albino rats (12 in each group and equally distributed according to sex, litter and body weight) were fed on synthetic diets in which cocoanut meal or protein food or skim milk powder formed the sole source of protein. The level of protein in all the diets was maintained at 10 per cent. The diets were adequate with respect to other dietary essentials namely fat, minerals and vitamins. Records of daily food intake and weekly gain in weight were maintained. The protein efficiency ratios were calculated for periods of 4 and 8 weeks. The results are presented in Table II.

It may be observed from the results that the protein efficiency ratio (P.E.R.) of cocoanut proteins at 10 per cent level of protein intake is quite high (2.04) and compares favourably with that of skim milk powder proteins (2.29). The P.E.R. of cocoanut proteins is higher than those of the proteins of low fat groundnut flour (1.47) and Bengalgram (1.27) reported earlier[17]. The P.E.R of mixed proteins of low cost protein food (1.72) is also higher than those of the proteins of groundnut and Bengalgram. It is therefore evident that a low cost protein food containing proteins of high

TABLE II. *The protein efficiency ratio of the proteins of cocoanut meal and low-cost protein food as compared with that of skim milk powder*

(Level of protein in diet 10 %)

Group* No.	Material	Protein efficiency ratio: in 4 weeks		Protein efficiency ratio: in 8 weeks	
A.	Cocoanut meal ...	2.33	± 0.083 (20 d.f.)	2.04	± 0.056 (20 d.f.)
B.	Low-cost protein food	1.87		1.72	
C.	Skim milk powder ...	2.99		2.29	

Result of test of significance:

A ~ B significant at	0.1 % level	0.1 % level
A ~ C ,,	0.1 % ,,	1.0 % ,,
B ~ C ,,	0.1 % ,,	0.1 % ,,

* Each group contained 12 rats (6 males and 6 females)

nutritive value can be prepared by blending cocoanut meal with groundnut meal and Bengalgram dhal. Such a product can be used for supplementing human diets in regions where cocoanut meal is available in large quantities. Consumer acceptability trials have shown that the protein food is highly acceptable. Studies on the supplementary value of the low-cost protein food fortified with minerals and vitamins to the diets of children are in progress.

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THE CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF COCOANUT AND ITS PRODUCTS

By K. Krishnamurthy, R. Rajagopalan, M. Swaminathan and V. Subrahmanyan

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Cocoanut palm, *Cocos nucifera* Linn, is widely cultivated in the tropical countries[1, 2]. The principal use of cocoanut is in the manufacture of *copra* from which cocoanut oil and cocoanut cake are obtained. Cocoanut kernel is also used for edible purposes and forms an ingredient in many food preparations including confectionery. Tender cocoanut water is consumed as a beverage. The yield of nuts per palm varies from 60 to 100 per tree per year. The world production of copra is given in Table I. The most important cocoanut producing countries are: Ceylon, Philippines, Malaya, Indonesia and India.

TABLE I. *World production[3] of copra during the year 1955*

Country	Annual production of copra (metric tons)
North and Central America ...	130,000
South America	25,000
Ceylon	293,000
Malaya	146,000
India	185,000
Indonesia...	730,000
Philippines	1,076,000
Africa	120,000
World Total	3,050,000

Chemical composition of the nuts: In the tender nuts, the kernel is soft and thin and in the mature nuts it is several millimeters thick and hard. The composition of the nuts and of other cocoanut products is given in Tables II and III[2].

Cocoanut Oil

Extraction: Cocoanut oil is extracted from copra by different processes—ghanis, expeller and hydraulic presses and by solvent extraction[4, 5]. The yield of oil from copra depends on the moisture content of copra and on the efficiency of the extraction process[1].

Composition and uses of cocoanut oil. Cocoanut oil is colourless to light brown in colour and has a characteristic aroma. The physical and chemical characteristics of the oil and fatty acid composition[6] of cocoanut oil as compared with palm kernel and groundnut oils are given in Table IV and V. Cocoanut oil is distinguished by high R.M., Polenski and saponification values and low iodine value.

TABLE II. *Composition of cocoanuts[2]*

Constituent	Minimum	Maximum	Average
Shell% ...	23.5	32.8	27.8
Kernel% ...	48.2	62.0	55.2
Cocoanut water% ...	8.2	25.1	17.0

TABLE III. *Composition of cocoanut products[2, 38]*

Material	Moisture%	Protein%	Fat%	Carbohydrate (by difference)%	Crude fibre%	Ash%
Water from unripe nuts ...	95.01	0.13	0.12	4.11	0.0	0.63
Water from ripe nuts ...	91.23	0.29	0.15	7.27	0.0	1.06
Kernel from unripe nuts ...	90.8	0.9	1.4	6.3	...	0.6
Kernel from ripe nuts ...	46.3	4.08	37.29	11.29	3.39	1.03
Copra ...	5.8	8.9	67.0	16.5	4.1	1.8
Desiccated cocoanut ...	3.5	6.3	57.4	31.5	7.5	1.3
Cocoanut cake						
Minimum ...	5.49	10.36	2.43	32.36	5.65	2.68
Maximum ...	19.55	29.73	23.04	79.08	28.30	9.45
Average ...	10.66	19.06	11.05	55.18	14.12	4.05

TABLE IV. *Analytical characteristics of cocoanut oil[6]*
(A.O.C.S. standards for cocoanut oil)

Specific gravity at 25°/15.5°C	... 0.917 — 0.919
Refractive index at 40°C	... 1.448 — 1.450
Iodine value	... 7.5 — 10.5
Saponification value	... 250 — 264
Unsaponifiable matter	... Not over 0.5
Titre °C	... 20 — 24
Reichert Meissl value	... 6 — 8
Polenski value	... 15 — 18

TABLE V. *Percentage fatty acid composition of cocoanut oil as compared with palmkernel and groundnut oils*[6]

Fatty acid	Cocoanut	Palmkernel	Groundnut
Caproic ...	0.8	...	...
Caprylic ...	5.4	2.7	...
Capric ...	8.4	7.0	...
Lauric ...	45.4	46.9	...
Myristic ...	18.0	14.1	...
Palmitic ...	10.5	8.8	8.3
Stearic ...	2.3	1.3	3.1
Arachidic etc ...	0.4	...	6.6
Oleic ...	7.5	18.5	56.0
Linoleic ...	...	0.7	26.0

Cocoanut oil is used extensively for edible purposes for which the oil is also refined, deodorised and winterized. The stearin obtained in winterization is known as cocoanut butter and is used in confectionery. Refined cocoanut oil by itself and after hydrogenation is used to a limited extent in the biscuit industry as a shortening[6]. The major industrial use for this oil is in soap industry.

Nutritive value of cocoanut oil: Cocoanut oil has been reported by many workers to be digested and absorbed to the extent of 95-98 per cent in the system[7-11]. The oil is absorbed as rapidly as butter fat and more rapidly than peanut oil and this has been attributed to the low molecular weight of the fatty acids[12]. It has been reported that cocoanut oil when incorporated in a poor vegetarian diet, caused a negative nitrogen balance, but Sadasivan[16] and Narayana Rao[17] could not confirm the above observations.

Cocoanut Proteins

Amino acid composition: The main protein present in cocoanut is a globulin, the 'conglutin', of Ritthausen[18] and the 'phytovitellin' of Chittenden and Setchell[19]. Kirkwood and Glies[20], who regarded this protein as 'edistin', prepared it in a crystalline form. They found that the globulin contained 18.24 per cent nitrogen and 1.84 per cent ash. They also obtained a protease from the globulin filtrate.

The amino acid composition of cocoanut proteins has been determined by many workers[21-26]. The amino acid composition of cocoanut proteins along with other oilseed proteins and whole egg[27] is presented in Table VI. Cocoanut proteins are moderately good sources of all essential amino acids. It has been reported that the methionine content of the proteins decreased on storage.[26]

TABLE VI. *Amino acid composition of cocoanut proteins as compared with the proteins of certain oilseeds and whole egg*
(Calculated to 16 g. nitrogen)

Amino acid	Cocoanut				
	63 globulin	23 Whole	27 Peanut	27 Sesame	27 Whole egg.
Arginine ...	15.0	10.8	11.3	8.7	6.2
Histidine ...	1.4	1.6	2.1	1.5	2.1
Lysine ...	4.0	3.0	3.0	2.8	6.3
Tryptophan ...	0.6	1.0	1.0	1.8	1.1
Phenylalanine ...	4.7	3.9	5.1	8.0	5.7
Methionine ...	...	1.5	1.0	3.2	3.2
Leucine ...	6.6	7.9	6.7	7.5	9.0
Isoleucine ...	4.1	4.7	4.6	4.8	6.2
Valine ...	5.4	4.9	4.4	5.1	7.0
Threonine ...	5.5	2.9	1.6	4.0	4.9

Nutritive value of cocoanut proteins: As early as 1919 Johns *et al*[28] found by feeding experiments that cocoanut cake proteins furnished all essential amino acids. Mitchell and Villegas[29] reported a biological value of 58 for cocoanut proteins. Higher biological values (77 and 69) were reported by Swaminathan[30] and Smuts and Malan[31]. Mitchell[32] using a solvent extracted meal which was not subjected to higher temperatures found a digestibility co-efficient of 86 per cent and biological value of 71 for the proteins. He pointed out that drastic heat treatment involved in the expeller extraction method reduced the biological value to 58. Krishnamurthy *et al*[33] studied the nutritive value of cocoanut proteins both by nitrogen balance and growth methods. They reported that cocoanut cake proteins had a digestibility co-efficient of 74, biological value of 68 and protein efficiency ratio of 2.1.

Carbohydrates in Cocoanut

Dried Cocoanut (copra) contains 15-20 per cent of carbohydrates.[34-36] The nature of carbohydrates in the copra was determined by Caray[37] who reported that the carbohydrate fraction consisted of a large percentage of cellulose and sucrose together with a number of sugars. It is of interest to note that besides glucose and fructose, the presence of galactose, raffinose and pentoses has been reported. The nature of carbohydrates present in cocoanut is given in Table VII. It may be seen that nearly 50 per cent of the carbohydrates consist of cellulose and pentosans which are known to be not digestible in the human system.

TABLE VII. *The nature of carbohydrates in copra*[37]

	As % of total carbohydrates
Sucrose ...	... 32.82
Raffinose ...	... 5.54
Galactose ...	... 5.54
Glucose ...	... 2.72
Fructose ...	... 2.75
Pentoses ...	... 5.49
Cellulose ...	... 35.63
Pentosans ...	... 5.09
Starch ...	... 1.98
Dextrin ...	... 1.29
Galactan ...	... 1.10

Vitamins in Cocoanut

Fresh kernel contains 15 I.U. of thiamine and 1 mg. of ascorbic acid, traces of vitamin A[38] and 0.2 mg. of tocopherol[39] per 100 grams.

Minerals in Cocoanut

Fresh cocoanut kernel contains potassium 436 mg; calcium 13 mg; Magnesium 52 mg; Iron 2.08 mg; Copper 0.32 mg; Phosphorus 94 mg; Sulphur 33 mg; and chlorine 114 mg per 100 grams[40].

COPRA

Two types of copra namely milling and edible varieties are manufactured on a commercial scale. Nearly 80 per cent of the copra production is of the milling type. Milling copra is made both from freshly harvested and stored nuts. The kernel is dried in the sun or in kilns or by a combination of the two methods. Edible copra is made by storing the mature unhusked nuts on bamboo platforms in the shade for several months, during which period they get dried slowly. The quality of copra is judged by the quality and quantity of the oil it contains. The keeping quality of copra depends upon its moisture content. Copra dried to 5 per cent of moisture does not deteriorate to any appreciable extent while copra having a moisture content above 10 per cent is prone to mould damage, during storage[41].

Desiccated Cocoanut

Desiccated cocoanut is manufactured from the fresh, mature nuts. The shell is chipped off with a sharp axe and the brown testa is shaved off. After the kernel is washed several times in fresh water, it is shredded. The shredded material is dried in the hot air ovens and the desiccated material is graded for the size of the grain and packed like tea in sealed lead-lined wooden cases. On an average in Ceylon about 1,000 nuts yield 350 lb. of desiccated cocoanut. The following seven grades of desiccated cocoanuts are mentioned in order of their fineness: *macaroon*, *fine*, *medium*, *coarse*, *chips*, *tapes* and *shreds*. The fine and medium grades are largely exported. The desiccated cocoanut is used in the manufacture of cakes, pastries and chocolates.

COCOANUT CAKE

The residue after extraction of oil from copra is the cocoanut cake. As can be seen from Table III cocoanut cake contains about 20 per cent protein. Large quantities of the cake are used as cattle feed and in recent years considerable interest is being evinced in the use of the cake as a protein supplement to human diets[42, 43].

Kuppuswamy *et al*[42] reported that cocoanut meal possessed a good supplementary value to poor rice diet, when incorporated at 10 per cent level in the diet. They also reported that cocoanut proteins supplemented rice proteins to a greater extent than sesame, cottonseed or groundnut proteins. Sadasivan[43] observed that cocoanut cake when incorporated at 30 per cent level in a poor rice or tapioca diets produced a marked increase in the growth of rats on the diet.

Sulit[44] reported that at 37 per cent level in a complete diet cocoanut meal exhibited growth promoting properties but at 75-85 per cent level it showed adverse effects. Krishnamurthy *et al*[33] reported that cocoanut meal can be used for the preparation of a low cost protein food and that the proteins of a low cost protein food prepared by blending cocoanut meal (1 part) with low fat groundnut flour (2 parts) and Bengalgram flour (1 part) had a P.E.R. of 1.72 which is higher than those of the proteins of groundnut and Bengalgram reported earlier by Kantha Joseph *et al*[62].

COCOANUT WATER

Cocoanut water from tender nuts is being used extensively as a beverage in India and other tropical countries. It is considered to possess therapeutic properties according to Ayurvedic system of medicine[45]. The composition of cocoanut water is given in Table VIII. Cocoanut water contains only small amounts of protein (0.43 per cent)[46]. Pradera *et al*[47] studied the composition of cocoanut water and reported that it contained small amounts of different amino acids. Cocoanut water was reported to be a poor source of thiamine but a fair source of riboflavin[48], nicotinic acid, biotin and pantothenic acid[47] and ascorbic acid[49, 50]. Child and Nathanial[51] reported that the concentration of sugars increased from 1.5 per cent to 5.0 per cent in the early months of maturation and then fell to 2 per cent at 12 months. Cocoanut water has been used for feeding infants suffering from intestinal disturbances[52]. Intravenous use of cocoanut water has been reported to cure nutritional oedema[53] and severe under-nutrition[54] and cause diuresis without producing side effects[55].

TABLE VIII. *Composition of unripe cocoanut water*

Constituent	Per 100ml.[5] (g)	Constituent	Per 100ml.[40] (mg)
Total solids	4.71	Sodium	15.0
Reducing sugars	0.08	Potassium	312.0
Sucrose	1.28	Calcium	29
Total sugars	2.08	Magnesium	30
Ash	0.62	Iron	0.1
Unidentified organic substances	2.01	Copper	0.4
		Phosphorus	37
		Sulphur	24
		Chlorine	183

Milk substitutes from cocoanut: People in the west coast of India and Ceylon prepare 'cocoanut milk' (a milk-like emulsion) from fresh mature cocoanut and use it in several food preparations. Gesteira and Bahia[56] successfully treated more than 50 children suffering from gastro intestinal disturbances with cocoanut milk. De *et al*[57] and Varadarajan[58] found that milk from cocoanut had a high percentage of oil without an adequate amount of protein to balance it. Moorjani[59] described a method for the preparation of milk from cocoanut. The process consisted in macerating cocoanut kernel with water and cocoanut water and filtering through a cloth. He reported an yield of 2 lb. of milk per cocoanut. The composition of the milk is given in Table IX.

TABLE IX. *Composition of cocoanut milk*[59]

Component	%
Total solids ...	10.2
Protein ...	0.8
Fat ...	7.1
Carbohydrates ...	1.75
Sucrose (in carbohydrates) ...	1.4
Reducing sugars (in carbohydrates) ...	0.35
Minerals ...	0.55
Calcium (mg.) ...	3.2
Phosphorus (mg.) ...	33.0

The milk was reported to curdle on boiling and this was attributed to the low protein content. The same author reported that the stability and nutritive value of cocoanut milk could be improved by the addition of 0.8 per cent casein (as sodium caseinate) or skim milk powder or protein rich materials like groundnut or soyabean.

Conclusion

The data presented in this review would indicate that cocoanut meal, which is obtained as a by-product of cocoanut oil industry, is a good source of protein of high biological value. Considerable interest has recently been evinced in many countries on the utilization of oil seed meals as protein supplements to human diets, in order to combat protein malnutrition which is widely prevalent particularly among children belonging to low-income groups[60]. But many of these protein foods are not of high nutritive value and lack to varying extents in the essential amino acids, tryptophan, methionine and lysine[27]. Cocoanut proteins, on the other hand, are of high nutritive value and are fairly rich in lysine, methionine and tryptophan[23]. In view of the fact that cereals and proteins, in general, are deficient in lysine, cocoanut proteins can supplement cereal proteins to a considerable extent. Cocoanut meal can also be admixed with other more abundantly available meals like groundnut, soyabean etc., so as to obtain a low cost protein food containing all the essential amino acids. Suitable methods of processing the copra or the meal will have to be developed so as to improve the keeping quality of the residual meal. As the fibre contained in the meal interferes with adequate utilization of the proteins, attempts may also be made to eliminate the fibre in which case the meal will offer an excellent source of protein suitable for supplementing human diets. These and other aspects of the problem deserve to be investigated.

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Technical Seminars

THE Seminar which is a regular scientific activity of the CFTRI provides an open forum for all scientific workers of the Institute in so far as one of them presents a paper on a problem on which he is engaged or reviews an aspect of Food Science and Technology, while others participate in the discussion and express their views on the subject matter of the paper. The visits of distinguished scientists and technologists are also availed of for arranging addresses to such gatherings. Summaries of the Seminars held during October, 1958 are given in this section.

S (IS) 26

Problems relating to the packaging of hygroscopic products, by H. B. N. Murthy, (*October* 4, 1958). Packaging of moisture sensitive products offers quite a few problems to the packaging technologist. In the case of a product which does not undergo any deteriorative change during storage such as browning and for which the limiting factor is one of moisture protection, a hermetically sealed container is obviously the best choice. But in most cases, considerations of cost and other factors usually preclude the use of tin and glass containers.

In recent times, flexible packaging materials are increasingly coming into use. Films made out of various plastics such as polyethylene, pliofilm, regenerated cellulose—plain and moisture proof, coated papers, aluminium foil and various laminates, offer themselves as good barrier materials. However, each film has specific uses depending upon its physical properties.

Many factors have to be taken into consideration in designing a package for a hygroscopic product. These include (*a*) Inherent characteristics of the product such as critical moisture content and permissible moisture pick-up, (*b*) Temperature and humidity conditions during transit and storage in sales area, (*c*) Desired shelf life, (*d*) Water vapour permeability of the packaging material and (*e*) Compatibility of the packaging material.

The permeability of the packaging material depends upon factors like thickness, effects of creasing, efficiency of the ultimate seals and closures, and the difference in humidity between the contents of the package and the storage atmosphere. Compatibility of the packaging material with the product has also to be taken into consideration in order to avoid tainting of the product either by external odours or by the characteristic odour of the packaging materials themselves. In addition to these, the shelf-life of the finished package is also dependent on the shape and size of the unit container, bulking of the unit packs and overwrapping of the bulked primary units.

By adjusting the shape of a container nearest to a cube for a given volume, the maximum shelf-life efficiency can be attained. If the dimensions of the package are farther away from a cubical shape, the shelf-life efficiency will be reduced proportionately and the cost of packaging material used will also be enhanced.

Bulking of the primary units enhance the shelf-life by 2-3 times and the use of an overwrap over the bulked unit-pack, increases the shelf-life by 3-8 times. Methods of determination of shelf-life of finished packages were described. Results were presented on the evaluation of shelf-life of dehydrated bananas by using the 'General Mills method'.

Though the package is generally designed to fit a product, sometimes it may be necessary to fit the product to the package by making slight alterations in order to achieve the desired shelf life and also reduce the packaging costs. This was illustrated by taking examples of Multipurpose Food sweets and dry dessert mixes.

Preliminary work carried out on packaging of M.P.F. sweets and dehydrated bananas was described. In the case of M.P.F. sweets, it was observed that the standardised product had an initial moisture content which was already sufficient to promote mould growth. Such a product does not lend itself to easy packaging methods since the product will be susceptible to mould attack in course of time unless alternate methods like sterilisation after packing or use of antimycotic treated papers are employed.

Dealing with the problem of the packaging of dehydrated bananas, the speaker said that the product had an initial moisture content of 18-20 per cent and a critical moisture content of 23-24 per cent. The present pack used by the trade gives a shelf-life of about 90 days and preliminary studies indicate that by using a barrier material having nearly half the water vapour permeability of the present material, it is possible to obtain a considerable increase in shelf-life of the product. Since the rate of browning is dependent on the moisture content of the material, it seems possible that by starting with a material having as low a moisture content as practicable, the extent of browning could also be controlled. Further work on these lines is in progress.

The talk was then followed by a lively discussion during which merits and demerits of various methods of determination of equilibrium relative humidity, use of in-package dessicants, use of antimycotic agents in wrappers, amount of wax used in coating biscuit packets, shape of containers, determination of water vapour permeability through creases, etc. were raised.

The President, in his concluding remarks, stressed the importance of the subject and said that economics of packaging any product was an important factor to be taken into consideration. He also said that the packaging material should not affect the organoleptic quality of the product and that enough concentration of sulphur dioxide in dehydrated products was necessary to prevent mould growth. He stressed the need for active collaboration with the industry in such problems.

S (IS) 27

Physico-chemical investigations on adulteration in tomato products, by G. S. Siddappa. (*October* 18, 1958). On account of the simplicity of the technique of manufacture and the scope for increasing yields by the use of other cheaper fruit and vegetable pulps to replace tomato solids to varying extents, a variety of adulterants like carrot, pumpkin, ash-gourd, sweet potato, papaya, apple pomace, etc., are often employed. To cover up any resulting dullness in colour, artificial colours are freely used. This is rather an unhealthy sign for the development of the Indian industry.

Previous workers have made use of analytical data regarding insoluble solids, non-sugar solids, aqueous and acetone lead numbers, potash content, etc., for determining approximately the tomato solids in some tomato products. Recently, however, lycopene, the characteristic carotenoid pigment of tomatoes, has been made use of to estimate the amount of tomato solids in tomato puree, canned tomatoes, etc. The speaker then described the results of a systematic study made to find out to what extent the lycopene content of the ketchup could be utilized to find out the 'purity' of the product in relation to the different fruit and vegetable pulps commonly employed as adulterants.

Ketchups, genuine as well as adulterated, were prepared using carrot, ash-gourd, pumpkin, sweet potato, papaya and apple pulps to replace 25 per cent of the tomato solids. The lycopene content of the raw-material as well as of the finished ketchups was determined using a Beckman Spectrophotometer by two methods. In the first method, which was the more accurate one, interference at 473 mμ due to beta-carotene was eliminated by deducting from the observed reading for the total carotenoids the reading due to the beta-carotene present and the correct value for lycopene only obtained by making use of the molecular extinction coefficient for lycopene at 473 mμ, namely 18.6×10^4. In the second method, the absorption of the petroleum ether extract at 503 mμ was made use of directly to estimate the lycopene content as, at this position, beta-carotene has negligible interference. The errors involved in this rapid method, which avoids the necessity of chromatographic separation of the beta-carotene, were quite small.

In the different ketchups studied, the lycopene values ranged from 420 to 485 μg./g. of tomato solids. Employing a tentative value of 475 μg/g of ripe tomato solids, the calculated values for the tomato solids content of the different ketchups agreed very closely with the actual values, indicating thereby the possibility of utilizing the lycopene value as an index of purity of the ketchup. Variety, season, method of preparation, temperature and period of storage are likely to influence this index. Under the conditions studied, however, the variation was small.

Dealing with the scope of other analytical methods, the speaker said that the estimation of the crude fibre content of the ketchups gives an indication of adulteration with other fruit and vegetable pulps as these lead to an appreciable increase in the value. The addition of carrot pulp is revealed by an increase in the beta-carotene value and decrease in the lycopene/beta-carotene ratio and also by the presence of the Xylem vessels when examined under the microscope. The addition of sweet potato pulp is revealed by the characteristic blue band on a circular paper chromatogram for sugar. The presence of spots due to chlorogenic and caffeic acids on a polyphenol chromatogram shows the presence of added apple pulp. Chromatographic separation of the organic acids does not, however, lead to any characteristic spots suitable for identification work. Staining with iodine, methylene blue and ruthenium red, either singly or in combination, followed by washing with water, does give some indication of the nature of the added material, but the results are not conclusive by themselves.

At the end of the talk, there was a lively discussion touching on the various aspects of the problems, such as the likely variations in lycopene content due to the use of green tomatoes which contain very little lycopene, increase in viscosity of the ketchup due to addition of starchy materials, possible effects of mould growth on lycopene content of tomatoes, varietal differences as regards polyploidy, measurement of absorption in the Ultra-Violet—region with a view to detected any specific nature of the adulterants, shift in the absorption maxima due to thermal isomerisation of the carotenoid pigments as one of the possible explanations for the observed increase in the lycopene values during storage of the ketchups, etc.

In his concluding remarks, the President pointed out the need for extensive work as regards variety and stage of maturity of the tomatoes as well as adulterants employed, as they are likely to have a considerable effect on the lycopene and crude fibre values. Although the method proposed could be simplified to a great extent by replacing the spectrophotometer by a Lume-tron having suitable additional filters, there was still the necessity to simplify it still further for adoption as a routine control measure. He said that a simple colour reaction characteristic of tomato, but not of other substances, or vice versa should be developed. He also felt that the industry should be informed of the best varieties to be used for the production of genuine tomato ketchup without recourse to artificial colour.

Information and Advice

In pursuance of the policy of rendering technical aid to food industries in the country, the CFTRI supplies information on technical and other problems, carries out analytical work and undertakes short- and long-term investigations on behalf of the industry, besides bringing out publications containing important technical advances in different aspects of Food Science and Technology. The Institute deals with a number of enquiries from various food industries and others interested in Indian processed food products. A few of the enquiries answered are reproduced in this section.

Composition of soyabean

S (IS) 97

I will be greatly obliged if you will be kind enough to let me have the composition of soyabean. (Bombay).

We are furnishing below the composition of soyabean:

Water	...	8.1
Protein	...	43.2
Fat	...	19.5
Mineral matter	...	4.6
Carbohydrate	...	20.9
Fibre	...	3.7
Calcium	...	0.24%
Phosphorus	...	0.69%
Iron	...	11.5 mg. %
Vitamin A	...	710 I.U./100 g.
Thiamine	...	730 μg. %
Riboflavin	...	760 μg. %
Niacin	...	2.4 mg. %
Ascorbic acid	...	...
Food energy value	...	432 cals /100 g.

Recipe for custard powder

S (IS) 98

Kindly give me the recipe for Vanilla custard. (Anantharajupet P.O., Cuddapah District).

The recipe for vanilla custard is as follows:

Sugar	...	7 oz
Corn flour	...	¾ oz
Yolks	...	5-8
Milk	...	1¾ pints.
Vanilla bean (or Essence)	...	1

Place in a mixing bowl sugar, yolks and corn flour, mix all well together and stirring all the time, add the boiling milk together with the vanilla bean boiled in it. Continue to stir on the stove until the custard has acquired the desired consistency. If required later to stir in some whipped cream, the recipe given should be amended by including five sheets of gelatine; in winter time four sheets are probably sufficient.

Lemon chiffon custard

S (IS) 99

I am interested in the preparation lemon chiffon custard and I shall appreciate if you could kindly inform me the recipe for the same.

The following is the recipe:

Flour	...	3½ tablespoon
Sugar	...	2/3 cup
Butter	...	2 tablespoon
Eggs, separated	...	2
Lemon juice	...	3 tablespoon
Milk	...	2/3 cup

Mix flour and sugar together and add to creamed butter, blending thoroughly. Stir in beaten egg yolks, lemon juice, and milk; and fold lightly but thoroughly into stiffy beaten egg whites. Fill individual custard cups 2/3 full and set in a shallow pan filled with enough hot water to come almost to the top of the cups. Bake in a moderately slow oven (325°F) for 35 minutes. This custard separates into two distinct layers, a puffy cake-like topping and a creamy custard bottom layer.

Cake mixtures

S (IS) 100

I shall appreciate if you could kindly let me have the recipe for cake mixture. (Anantarajupet P.O., Cuddapah Dist.).

The general formula of cake is as follows:

	Ordinary yellow cake	Ordinary white cake
	Parts	Parts
Sugar	25.5	25.8
Flour	29.8	25.8
Fat (shortening)	13.4	13.0
Milk	14.8	15.4
Eggs	14.8 (whole egg)	17.8 (egg whites)
Baking powder	0.7	0.9
Salt	0.6	0.6
Flavour	0.4	0.5

The shortening and flour are creamed together until a fluffy mass is obtained. Eggs and sugar are simultaneously whipped together in a separate bowl for 10 minutes until a semi-firm foam results. The sugar-egg foam is combined with creamed flour and shortening, after which the milk is added in small portions with constant stirring. The other ingredients are added and the resulting batter is spread in cake pans and baked without any delay in a baking oven at 325°-350°F for different periods depending upon the nature of the cake desired.

Ice cream mixtures

S (IS) 101

How are ice cream mixtures prepared and what is the recipe for the same. (Anantharajupet P.O., Cuddapah District).

The information is given below.

Vanilla ice cream :

Milk	...	6 cups
Sugar	...	2½ cups
Salt	...	½ teaspoon
Eggs	...	4
Vanilla	...	1½ tablespoons
Cream	...	4 cups

Beat the eggs until light and fluffy, and add sugar gradually, beating well after each quarter cup addition. When the mixture becomes stiff and difficult to beat, add milk, cream, vanilla and salt and mix thoroughly. The mixture is then chilled, and frozen in a freezer.

Fruits such as orange, grapes, raspberry, etc., are also included in the formula and a small quantity of gelatine is added as a stabiliser.

The formula for a standard ice cream is as follows:

(Ingredients for 100 lb. mixture)

Cream (40% fat)	24.61	lb.
Milk (4% fat)	53.79	,,
Skim milk powder	5.18	,,
Sugar	12.12	,,
Gelatin	0.30	,,
Corn syrup solids	4.00	,,
Any desired flavour and colour		

Percentage composition

Fat	12%
Non-fat milk solids	11%
Sweetening effect	14%
Stabiliser	0.3
Total solids	39.3%

Books on Confectionery

S (IS) 102

Kindly suggest me some books on confectionery. (Anantharajupet P.O., Cuddapah District).

The following books will be useful.

(1) Meta Given's Modern Encyclopedia in cooking, Vol. I, published by J. G. Ferguson and Associates, Chicago, 1949, 3rd Edition.

(2) Swiss Bakery and Confectionery, by Walter Bechmann, published by Maclaren and Sons Ltd., London, 1949.

(3) The Standard American Encyclopedia of Formulas, by A. A. Hopkins, published by Grosset and Dunlop, New York, 1953.

(4) Baking Science and Technology, Vol. I and II, by E. J. Pyler, published by Siebel Publishing Company, Chicago, Illinois, 1952.

(5) A Text Book of Candy Making, by Alfred E. Leighton, published by the Manufacturing Confectioner Publishing Co., Oak Park, Illinois, 1952.

(6) Manufacture of Confectionery, published by Industry Publishers Limited, 22, R. G. Kar Road, Calcutta-4.

(7) The Baker's Dictionery, compiled by Albert R. Daniel; published by Maclaren and Sons Ltd., Stafford House, Norfolk Street, London, W.C. 2.

Milk sugar from whey

S (IS) 103

Is it possible to have milk sugar from the curdal whey from which casein is extracted? (Ferozepur).

The whey left over after the separation of casein can be used for the preparation of milk sugar namely lactose. The whey is heated to boiling in an iron tank and milk of lime is added until the acidity is about 0.05 per cent. The whey protein coagulates at this stage and it is allowed to settle down. The clear whey is then concentrated in a vacuum evaporator to a thin syrup. This syrup is filtered to remove impurities and the filtered syrup is again concentrated in the vacuum evaporator to about 38-40° Baume. Part of the sugar crystallises during concentration in the pan and the rest during the subsequent cooling. The crystals are separated and purified to remove colour, protein and salts.

Composition of rice, papaya and banana

S (IS) 104

We shall feel thankful if you could kindly let us have from literature the chemical composition of rice, papaya and Banana. (Bangalore).

The information is given below:

Anchovy sauce

S (IS) 105

Would you please let us know the method for preparing Anchovy Sauce and how to preserve it for longer shelf life. Please also give the recipe in detail. (Calcutta).

The method of preparation and the recipes for Anchovy Sauce are given below:

Recipe I

Water	5½	gals.
Vinegar	5	,,
Apple pulp	2-1/3	,,
Tomato puree	6	,,
Anchovy Essence	8½	pints
Browning (colouring)	5½	,,
Ginger syrup	6	,,
Acetic acid	1½	,,
Sugar (yellow crystal)	12	lbs.
Salt (Broken)	6	,,
Tamarind	18	,,
Date pickings	25	,,
Marmalade	18	,,
Gum tragacanth	10	oz.
Sultanas (chopped)	18	lbs.
Garlic (,,)	3	,,
Shalots (,,)	3	,,

After boiling the above batch, the following should be added and then simmered over a slow heat for another half an hour.

Corn flour	2½	lbs.
Citric acid crystals	2	,,
Ginger	8	oz.
Bayleaves	2	,,
Cloves	1½	,,
Mixed spice	4	,,
Cayenne pepper	2	,,
Mace	4	,,
Lemon flavour	½	pint.

Composition of rice, papaya and banana

Characteristics	Rice		Papaya (ripe)	Banana
	Home Pounded	Milled (Raw)		
Moisture %	12.2	13.0	89.6	61.4
Protein %	8.5	6.9	0.5	1.3
Fat (Ether extractives) %	0.6	0.4	0.1	0.2
Mineral matter %	0.7	0.5	0.4	0.7
Fibre %	...	...	...	...
Carbohydrates %	78.0	79.2	9.5	36.4
Calcium (Ca) %	0.01	0.01	0.01	0.01
Phosphorus (P) %	0.17	0.11	0.01	0.05
Iron (Fe) mg. %	2.8	1.0	0.4	0.4
Cal. value per 100 g.	351	348	40	153
Carotene (International Vit. A Units per 100 g.)	4	0	2020	Trace
Vit. B_1 μg./100 g.	180	60	40	150
Nicotinic acid mg/100 g.	2.4	1.2	0.2	0.3
Riboflavin μg/ 100 g.	120	80	250	30
Vitamin C mg. %	...	...	46	1

Recipe II

Water	5½	gals.
Vinegar	6	,,
Apple pulp	2½	,,
Tomato puree	6	,,
Anchovy Essence	7	pints
Browning	6	,,
Ginger syrup	6	,,
Acetic acid	1¾	,,
Sugar (yellow crystal)	12	lbs.
Salt (broken)	6	,,
Tamarind	18	,,
Date pickings	25	,,
Marmalade	18	,,
Gum tragacanth	10	oz.
Sultanas (chopped)	18	lbs.
Garlic (,,)	3	,,
Citric acid crystals	2	,,
Mixed spices	1	,, 6 oz.

After boiling, add the following and then simmer over a slow heat for another half an hour.

Corn flour	...	2½	lbs.
Lemon flavour	...	½	pint.

The sauce, if bottled properly, will keep for a long time. The spices and acetic acid added during the preparation themselves act as preservatives.

Manufacture of glucose from bananas

S (*IS*) *106*

I have been producing large quantities of plantains and therefore, kindly let me know whether I can manufacture glucose from the same. (Poona).

Manufacture of glucose from bananas will not be economical as compared to other common sources such as corn starch, potato starch and tapioca starch. Although plantains contain fairly high percentage of starch, in the green immature state, the starch is not stable, as it is hydrolysed into free sugars during the process of ripening. The ripe plantains hardly contain any percentage of the starch.

The plantains can, however, be utilised with profit for preparing flour or powder out of it. The banana flour can also be obtained by powdering dehydrated bananas or banana chips.

Banana flour or powder can be used in the preparation of bakery products, vermicelli, grains, etc. The flour may be used to supplement wheat flour to the extent of 10-25 per cent in preparations like *chapatis*, *purees*, cakes, biscuits, bread and synthetic grains. Banana powder obtained from the ripe fruits is chiefly used in the preparation of beverages of the malted milk type, and in therapeutics for the treatment of celiac disease, sprue and other forms of carbohydrate intolerance. It is also used in the adult diet for the treatment of certain intestinal disorders.

Manufacture of gluten

S (*IS*) *107*

May I venture to know the information regarding gluten? (Agra).

Gluten is obtained by washing carefully the dough made out of wheat flour underneath a stream of running water. The starch is washed away by the water leaving behind an elastic brownish residue called as 'gluten' which consists principally of protein. It is composed chiefly of two well known proteins—a glutelin (glutenin), which imparts strength and a prolamin (gliadin), which is responsible for the sticky elastic character. Besides these, the group gliadin also consists some starch, fibre, sugar etc., which have not been removed in the washing operation. It does not contain all the proteins of wheat flour as some of the soluble proteins are washed away by water. The elastic residue can be dried at lower temperatures to yield a hard and brittle substance. This is doughed into a powder called 'gluten flour'. This flour is used in making gluten bread suitable for diabetics.

Almond flour

S (*IS*) *108*

Kindly let me know the method of preparation of almond flour. (Agra).

Almond kernels contain high percentage of fat. After expressing the oil from the kernels, a cake is left behind. This press cake on grinding yields almond flour or meal. Almond flour, being free from starch, is used in making bread and biscuits for diabetics. The composition of almond flour is as follows:

Water	...	8.51%
Protein	...	50,62%
Fat	..	15.63%
Fibre	...	2·86%
Ash	...	6.42%
Sugar and dextrin	...	7.18%
Starch	...	0

Casein from buttermilk

S (*IS*) *109*

I am interested in knowing how casein is separated from butter-milk and I shall appreciate if you could enlighten me on the same. (Ferozepur)

After removing butter by churning the curd, the butter-milk is heated to about 100° F and then dilute hydrochloric acid is added to it with constant stirring. Casein precipitates out and it is allowed to settle down. The clear whey is removed and the casein precipitate is washed several times in cold water. It is then dried in hot air driers.

The better procedure for the manufacture of casein would be to start with milk itself. After removing the fat with the help of cream separators, the skim milk is treated with dilute acid to precipitate the casein as mentioned above.

Notes and News

NEWS BRIEFS

Cold storage of table grapes: The lifetime of fresh grapes can be extended through cold storage by an average period of 3 months, varying with the species of grapes and with the soil and atmospheric conditions of the year of the vintage. It is necessary to choose large-grain varieties with strong stalks and with sugary pulp of small acid contents. The grapes must be kept at a constant cold-storage temperature and in moist air, so that a periodical disinfection is required. The grapes should be pre-cooled as soon as possible after harvesting and should, if possible, be pre-packaged in transparent material, which must not, however, prevent the vital interchange of gases.—J. A. Munoz-Delgado Ortiz, F. de la Camara Comella, M. Estada Giranta, *Revista del Frio*, 1957, **2**, 285. (*Food Manuf.*, June 1958, p. 253).

Lidding machine: The latest *Autopack* machine has been designed to lid and cap composite drums, small bottles, tins, etc., with diameters up to about 2 in. One of the more important applications of the machine is that of lidding pepper and spice drums at speeds of 30 to 120 per min., thus providing, according to the makers, Autopack, Ltd., very considerable savings in labour costs. The containers are received on the inlet conveyor, and delivered by a patented timing device into the pockets of a continually moving rotor, while the lids are fed into pockets in the top portion of the rotor from a standard unscrambling hopper. Both drum and lid are firmly held and positioned one above the other, until at a convenient point in the movement of the rotor they are brought together and the lid is pushed tightly home. The completed pack then passes on to the outlet conveyor.

Overload devices will immediately stop the motor in the case of overloading, or incorrect operation. The motor itself incorporates a brake and stops instantly, while a coloured light system indicates the reason for the stoppage. A hand wheel for hand feed is provided and is so arranged that the machine cannot be switched on if the hand wheel is engaged, and the machine cannot be operated at all unless all covers are firmly in position. A variable speed drive unit provides speeds from 30 to 120 per min. (*Food Manuf.*, June 1958, p. 256).

Aluminium foil wrap: Aluminium foil has been found superior to waxed paper and transparent film in preventing loss of flavour and riboflavin (vitamin B_2) in white rolls, according to studies conducted by the Wisconsin Alumni Research Foundation, Madison, Wisconsin.

Three common packaging materials—aluminium foil, waxed paper and transparent film—were studied for their effects on the riboflavin and moisture content of the rolls, which were measured after 0, 1, 2, 3, 4, 5, 7 and 14 days' exposure to 100 foot-candles of light at room temperature. Conditions stimulated those in a supermarket rather brightly illuminated during normal store hours.

Flavour evaluations were conducted after 3, 7 and 14 days' exposure of the rolls in the various packages.

The greatest losses of riboflavin, the researchers said, occurred during the first few days of exposure to light.

After two days the rolls wrapped in transparent film lost more than 40 per cent, while those in waxed paper lost about 23 per cent, and those in aluminium foil only 3 per cent.

After seven days, there was a riboflavin loss of about 60 per cent in the rolls wrapped in transparent film and about 40 per cent in those packaged in waxed paper. Losses in the foil wrapped rolls did not exceed 5 per cent.

Definite undesirable changes in flavour occurred in the rolls packaged in transparent film after seven days, according to the study, while foil wrapped rolls showed better retention of their original flavour and texture than did the rolls wrapped in waxed paper or cellophane. (*Food*, June 1958, p. 218)

New glucose-sweeter and less viscous: A new enzyme converted glucose, which will considerably widen the possible uses of glucose syrup throughout the food industry is now being manufactured under the trade name 'Sweetose'. The new glucose offers advantages in the manufacture of bakery products, beverages (brewed), beverages (carbonated), sweets and confectionery, canned foods, eggs (frozen), fountain syrups and toppings, fruits (frozen and canned), fruits (glaced and candied), ice-cream, sherbets and water ices, jams, jellies and preserves, mincemeat, salad dressing, sweet pickles and tomato ketchup. The advantages claimed for it are as follows: it is said to give a sweet syrup with excellent flavour transfer characteristics, with valuable moisture retaining powers and prevents sugar crystallization; it is more effective than ordinary glucose in retarding drying, and for this purpose is recommended to replace both ordinary glucose and invert sugar; because it is sweeter than ordinary glucose and has less viscosity. It improves flavour, and particularly in the case of mallow and jellies imparts a 'melt in the mouth' quality. Moreover, the drastic reduction in dextrine virtually eliminates the 'gummy' flavour of ordinary glucose, thus permitting the full flavour of the products to be appreciated. Its milder sweetness does not mask flavours in the same way as sugar; it has very good whipping properties which are of benefit in sweet and ice-cream manufacture—it whips to a lighter consistency than ordinary glucose, thus giving superior quality and lower process time; it is light in colour and resists discolouration under heat, therefore, it is recommended in the manufacture of white or light coloured sweets; although Sweetose has the effect of retaining moisture in food products the glucose itself contains less moisture than other sweeteners. Therefore, it is economical to use.

It is made by a partial acid conversion of corn starch followed by a special enzyme conversion which further increases the sweetness, lowers the viscosity and increases the moisture-retaining properties of the glucose. This double conversion process produces a better flavoured glucose than can be made by high conversion with acid alone, it is claimed. (*Food*, June 1958, 221).

Antibiotics do not extend storage life of shellfish: Crab meat and oysters treated with antibiotics (oxyterracycline and chlortetracycline) have no greater shelf life than that obtainable by usual good practice.

Crab meat ordinarily retains its typically fresh flavour up to 10 days under cold storage, and oysters up to 15 days. Application of antibiotics to crabmeat was made by using ½ lb. portions of the meat (in cheesecloth bags) and immersing them in the antibiotic solution (5-60 mcg./ml.) for 2 min.

Oysters were 'Blown' for 3 min. in 5-gal. lots added to 50 gal. of tap water containing 5 or 15 mcg./ml. of antibiotics.

While decreased bacterial counts were obtained in some cases, storage life of products treated was not increased beyond that of untreated controls subjected to the usual cold storage.—*Applied Microbiology*, 5 (6), 368-72, 1957. (*Food Engng.*, July 1958, p. 107).

Desiccant ups shelf life of N-packed dry foods: Dehydrated cabbage in a nitrogen atmosphere maintains its quality much better if it is packed with a desiccant cartridge in the package.

The test desiccant consisted of 50 g. 8-14 mesh CaO to 400 g. loose shreds of dehydrated cabbage, or 150 g. desiccant to 908 g. compressed shreds. The lime was held in cartridges of unglazed fiber.

Sulphur dioxide content changed very little from its initial value (1,852 p.p.m.) over 56 weeks when desiccant was present, whereas it dropped to 687 p.p.m. in 24 weeks in control packages.

With desiccant in the package moisture dropped from 5 to about 1½ per cent in 24 weeks. Browning was largely eliminated and ascorbic acid content was reduced very little.

In culinary quality packs with desiccant after 12-14 months at 100°F. were equal to packs without desiccant after 2-3 months. Because of space occupied by desiccant cartridge, about 5 per cent less uncompressed cabbage shreds can be packed in a container, and about 20 per cent less compressed dried cabbage.—*J. Sci. Food Agr.*, 9 (1), 14-18, 1958, (*Food Engng.*, July, 1958, p. 107).

Determining yeast quality: Carbon dioxide evolved during yeast fermentation depends both on the amount of yeast added and on the amount that grows. The two effects can be tested for by adding yeast to a suitable medium in a fermentation flask connected to a gas measuring burette.

For measurement of fermenting power a glucose-salts medium is used containing 10 per cent glucose. A high ratio of yeast to nutrient solution (1 ml. 50 per cent suspension of pressed yeast to 1 ml. nutrient solution in 25 ml. flask) is used.

Fermentation power is defined as ml. CO_2 evolved in 4 hour by a yeast of 22.5 per cent dry substance. A normal bottom yeast produces 14-15 ml. of gas at 45°F. Top yeasts may be tested in a similar way at 60°F.

To test fermenting power of yeast when growth is permitted, 0.2 g. pressed yeast is suspended in 100 ml. of wort and 10 ml. of suspension is fermented at 45 or 60°F. for 10 days, the CO_2 being measured at intervals.—*Svensk Bryggeri-tidskrift*, 263-70, Sept. 1957. (In Swedish). (*Food Engng.*, July 1958, p. 112).

Precision colour analyzer for lab. plant use: This colour-analysis instrument combines easy operation with highly accurate readings in per cent reflectance. Unit is sufficiently accurate for lab use, yet durable enough for production control.

Designated Spectronic Colour Analyzer, it consists of a spectrophotometer and reflectance attachment designed for convenient examination of various sized samples. Instrument projects a spot of light for accurate analysis of extremely small samples. For larger ones, the aperture cover swings out of the way, providing ample room for operating the shutter. A special trichromatic chart permits quick, simple conversion of reflectance readings to standard C.I.E. trichromatic values. Accurate readings of liquid or powdered samples can be obtained by use of an inexpensive glass cell and light shield.—Bausch and Lomb Optical Co., Rochester, N.Y. (*Food Engng.*, July 1958, p. 126).

Ready-miscible chocolate: Chocolate essence can now be extracted from cocoa by a non-thermal process. In the method, an aqueous mixture of cocoa and $Ca(OH)_2$ are stirred until extraction is complete. The filtrate from this is allowed to ripen. Any dissolved $Ca(OH)_2$ is removed, pH adjusted and the solution re-filtered. (*Indian Food Packer*, July 1958, p. 13).

Pellet Deaerator: Oxygen can be removed from packaged dehydrated goods after the usual vacuum treatment and flushing with nitrogen, by adding an intimate mixture of sodium sulphite and copper sulphate pentahydrate in pellet form. The copper ion catalyses the change of sulphite into sulphate. Lithium, potassium, barium, iron, and calcium sulphites may also be substituted while cobaltous oxide and stannous chloride are equally efficient catalysts.

Vacuum tumble dryer for heat-sensitive materials: A vacuum tumble dryer-blender, developed by Patterson-Kelley Co., Inc. makes it possible to dry heat-sensitive materials in a fraction of the time required by conventional methods. Fast drying-in-motion is the result of a carefully engineered balance of jacket circulation, vapour line and filter, compact piping, condenser, vacuum line and pump, and effective controls, the company claims.

The P-K vacuum tumble dryer provides an unusual baffling for uniform distribution of the heating medium in the jacket. Rapid generation of vapours within the vessel has a scrubbing action on all surfaces and considerably affects the heat transfer rate, the manufacturer states.

Fourteen standard models are offered, ranging in capacities from 1 to 150 cu. ft., (*J. agric. Fd. Chem.*, May 1958, p. 394).

NEW INDIAN STANDARDS

Synthetic resin adhesives: Adhesives form one of the important raw materials used in the plywood industry and woodwork and joinery industry. The selection of the adhesive and its correct use are important factors controlling the quality of the plywood or the joinery work produced. The raw materials for adhesives are not at all found in this country and a large quantity of raw materials and synthetic resin adhesives is imported. In the context of this background, it has been found necessary to lay down standards governing the quality of the raw materials and the performance expected from the prepared glues.

The Indian Standard Specification for Synthetic Resin Adhesives for Construction Work in Wood (IS:851-1957) is one of a series of Indian Standards on glue adhesives. Other standards in the series are on synthetic resin adhesives for plywood, cold setting casein glue for wood, natural sour (lactic) casein for glue manufacture and animal glue. The standard covers the following three types of material depending on their degree of resistance to water and micro-organisms:

(1) Weather and Boil Proof (WBP)
(2) Moisture Resistance (MR), and
(3) Interior (INT)

Other requirements specified are for keeping qualities and marking. The standard also gives instructions for use and procedure for tests for determining various characteristics of the material. (*ISI Bull.*, July 1958, p. 183).

Maize starch: The Indian maize starch industry had its beginning in 1938, and it developed rapidly during the last World War when imports of starch on which cotton textile industry principally relied, suddenly stopped and the industry had to draw its requirements from indigenous sources. Today, Indian maize starch industry is sufficiently developed to meet the entire local demand.

The Indian Standard Specification for Maize Starch for Use in the Cotton Textile Industry (IS:1184-1957) deals with maize starch, as manufactured by the sulphitation process, for use in the cotton textile industry as a sizing and finishing material. Requirements specified are in respect of size of granules; contents of moisture, starch, ash and protein; ether extract; free acidity; viscosity; and cold water solubles. Methods of estimating these characteristics together with sampling, marking and packing details are also included in the standard. (*ISI Bull.*, July 1958, p. 184).

Edible casein: Casein is considered to be a good protein nutritionally. It, therefore, finds use in the manufacture of predigested protein foods for oral administration in cases of protein malnutrition, gastric disorders and other symptoms, which call for protein supplementation.

The Indian Standard Specification for Edible Casein (IS:1167-1957) deals with the edible casein prepared by the acid precipitation method. Requirements and methods of test prescribed are in respect of moisture, total ash, acid insoluble ash, fat and nitrogen. (*ISI Bull.*, July 1958, p. 185).

DRAFT INDIAN STANDARDS

Cube sugar: The draft Indian Standard Specification for Cube Sugar stipulates limits for minimum sucrose content, minimum permissible moisture and reducing sugars. The purity of sugar has been controlled by specifying a maximum limit for specific conductivity. Suitable methods have also been prescribed in the draft specification to test the two main characteristics of cube sugar, namely it should have certain amount of hardness so that it does not break in packing and transport, and that it should disintegrate quickly in solution. (*ISI Bull.*, July 1958, p. 187).

PATENTS

Indian

60749: *Preparation of improved tetracycline antibiotic compositions.* A soluble source of alkaline earth ion and a pyridine derivative are added to a tetracycline antibiotic—Patented by American Cyananird Co. (*Res. & Ind.*, July 1958, p. 194).

58582: *Improvements in the production of tea concentrates:* Comprises extracting two aqueous solution water-soluble constituents of green leaf, oxidising the constituents in solution by heating, initially evaporating under vacuum 3-4 per cent of said solution and collecting and retaining separately the resulting distillate, concentrating said solution and restoring to the heavy concentrate said separately retained distillate—Patented by Transcontinental Development Co. (*Res. & Ind.*, July 1958, p. 194).

61063. *Preparation of streptomycin:* Fermenting a nutrient medium with a streptomycin-producing strain in the presence of an azoarylsulfonic acid salt—Patented by Chas. Pfizer and Co., Inc., (*Res. & Ind.*, July 1958, p. 114).

58222. *Process for simultaneously extracting oil and protein from oleaginous materials:* Comminuting grinding in aqueous alkaline solution to dissolve proteins, separating oil emulsion, protein solution and solids recovering therefrom—Patented by Georgia Tech. Research Institute (*Res. & Ind.*, July 1958, p. 194).

62517. *Improvements in confectioners hard butter:* Palm Kernel oil is hardened, interesterified and fractionated—Patented by Unilever Ltd. (*Res. & Ind.* July 1958, p. 194).

59224. *High initial effect insecticides:* Comprising 1-fluoro—3, 4, 5, 6, 7, 10, 10-heptachloro—4.7-Methylene-4, 7, 8, 9-tetrahydro naphthalene and/or 1:3-difluoro-4, 5, 6, 7, 10, 10-hexachloro-4, 7-methylene-4, 7, 8, 9-tetrahydro-naphthalene, together with diluent or carrier—Patented by Ruhrchemie Aktiengesellschaft (*Res. and Ind.*, July 1958, p. 194).

59281. *Process and apparatus for manufacturing woodboards, wood fibre panels and similar hardboard sheets:* Wherein the woodboards are pretreated to equalize temperature throughout—Patented by Soc. P. Az. Faesite (*Res. & Ind.*, July 1958, p. 196).

Foreign

2,828,209. Quick-cooking rice (U.S.). Improved texture and appearance are claims for a recently patented method of preparing quick-cooking rice.

First step is to heat the raw cereal to produce numerous small cracks or fissures in the surfaces of the grains. This is followed successively by water-and steam-cooking, then drying the grains in their expanded state. The product can be rehydrated ready for consumption in as little as 2 minutes. Heating will vary from 140-225°F. according to moisture content of the rice, but should not exceed 285°. Time will vary from 10-30 minutes with rate of heating preferably fast. Water-cooking will last from 6-18 minutes at temperatures from 190-212°F., yielding a gelatinized product that is then steam-cooked for 8-16 minutes. Rice is then quickly cooled and dried to a moisture content of 8-14 per cent. The process avoids loss of nutrient material, and produces grains that are bulkier and fluffier (15-50 per cent greater in bulk) than rice obtained by any prior process. (*Food Engng.*, July 1958, p. 107).

2,836,825. *Damage to meat minimized by centrifugal 'grinder' (U.S.)* An improved comminuting machine for continuously preparing meat to be used in sausage and similar products, that avoids heat damage due to friction, and discharges the emulsion free from entrapped air is the object of a recent patent. Another advantage claimed for the unit is its ability to cut up uncooked animal skins without heating. Machine has perforated plates and cutters somewhat similar to auger-fed grinders. Cutters, however, operate at much higher speeds. They perform the additional functions of propelling material through the plate, and mixing the various components. Fineness of product is controlled by selecting from a supply of removable perforated plates each with different size holes. Unit is also provided with a suction pump, throw-out rotor of which is mounted on a powered shaft leading from a motor in machine's base. Pump draws material toward and past the cutting section, then expels emulsion from the machine under pressure. To exclude air from cut material, pump housing is sealed from the atmosphere except where it connects with the cutting plate, and the outlet opening of the pump. In operation of the machine, meat is fed continuously to supply hopper and moves by gravity through an unobstructed space into cutting chamber. Here it is subjected to both impact-and draw-cutting as it is sucked through the perforated plate. Properly sized material is then discharged through spout to container. (*Food Engng.*, July 1958 p. 108).

794,911. *Soya beans:* Relates to a cooked soya bean product obtained by a process in which extracted soya bean oil meal is cooked or toasted while preserving in the finished product a high water-soluble protein content, high thiamin content, and other nutritional factors.—Patented by Central Soya Company, Inc., (*Food Trade Rev.*, July 1958, p. 52).

794,769. *Fungicidal compositions.* A fungicidal composition for use in the treatment of fruit and other agricultural products, especially citrus fruit such as oranges, lemons, grapefruit, etc., comprises an aqueous solution containing at least 0.25 per cent by weight of dissolved benzoic acid together with a wetting agent *e. g.*, an alkylaryl suphonate surface-active agent.—Patented by Monsanto Chemicals, Ltd., (*Food Trade Rev.*, July 1958, p. 52).

795,364. *Powdered milk:* Relates to a process and apparatus for converting finely divided particles of powdered milk, a substantial proportion of the lactose of which is in the form of the anhydride, into readily soluble powdered milk having a larger size than the finely divided starting material and in which a greater percentage of the lactose is in the form of the monohydrate.—Patented by Mil-ko Products, Ltd. (*Food Trade Rev.*, July 1958, p. 52).

Information from Foreign Journals

THE CFTRI has a Technical Translation Service which surveys technical and scientific publications in modern European languages in the fields of Food Science and Technology. The Service offers facilities of translation of scientific articles mainly from German, French, Dutch and Italian periodicals and covers a large number of publications in these languages. The translated material is made available to research workers and industries for their use on terms specified by the Institute. Lists of the translated contents of foreign journals and of the available translated articles are given in this section.

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Food Abstracts

THIS section contains abstracts of papers on Food Science and Technology selected so as to serve the needs of food and allied industries in India and is divided into three parts. Part I comprises abstracts of papers published by the CFTRI, Mysore, reprints of which can be had from the Institute on request. Part II consists of abstracts of papers published in important Indian journals. Part III contains abstracts of important articles from foreign journals.

PART I (CFTRI)

Some newer knowledge on coffee, by Subrahmanyan, V., Natarajan, C. P. and Bhatia, D. S., *ndian Coffee*, 1958 (January)—In his review, the AA have discussed some of the recent work on coffee. The chemical composition of coffee rew has been given and nearly 92 per cent of the constituents is ccounted. The composition changes according to the degree of roasting and the variety of coffee. Chlorogenic acid and sugars decease on roasting. The colour of roasted coffee can be determined by colorimetric techniques. The roasting temperature, level of ultraviolet absorption and the ratio of caffeine to chlorogenic acid have all a relation to colour. By measurng the percentage of reflected light rom the powder with the help of a reflection meter, it is possible to classify different roasts of coffee. The colour value, caffeine-chlorogenic acid ratio, ultra-violet absorption reading and probable temperature of roasting for light, medium, heavy and dark roasts of coffee are given. Chlorogenic, citric, caffeic, malic, tartaric, oxalic, pyruvic and acetic acids have been chromatographically identified in coffee brew and their amounts determined. Chlorogenic acid accounts for nearly 67 per cent of the total acids present in coffee. Coffee is also found to be a source of several vitamins. The amounts of niacin, thiamine, riboflavin, pantothenic acid, choline, folic acid, citrovorum factor, vitamins B_6 and B_{12} have been reported. Niacin increases from 2.2 mg/100 g. in green bean to 43.6 mg/100 g. in heavy roasts, the precursor of this vitamin being trigonelline. Coffee has been found to help digestion in the stomach by increasing the gastric acidity and peptic activity. Several amino acids *viz.*, alanine, aspartic acid, glutamic acid, glycine, leucine, phenylalanine, serine, threonine and valine have been estimated in coffee. Methionine, cystine and cysteine have also been reported. Roasted coffee contains free radicals and their concentration depends on temperature and duration of roasting. The components responsible for the aroma of coffee are very many and over 70 of them have been identified. Furfuryl—and methyl mercaptan are specific of coffee. The amounts of some of the volatile components are given. The various factors that control the brewing of coffee both by the steeping as well as filter methods have been discussed. It has been found that 'wetting' the powder prior to extraction in the filters improves the efficiency. In the field of soluble coffee, fixation and conservation of aroma is the major problem that still remains to be solved. The aromatic constituents of coffee are being studied by column and vapour phase chromatography. Volatile acids *viz.*, valeric, butyric, propionic and acetic, and fourteen neutral carbonyl compounds have been identified in coffee.

K.L.R.

Organic acids in passion fruit (*Passiflora Edulis Sims.*) **juice,** by Pruthi, J. S., *J. sci. industr. Res.*, 1958, **17 B** (6), 238.—Passion fruit juice has a total titratable acidity of 2.4-4.8 per cent. Citric and malic acids are the two non-volatile organic acids found to be present in passion fruit juice by the ascending paper chromatography. Citric acids form 93.26-96.22 per cent and malic acid 3.78-6.74 per cent of the total organic acid content of the fruit juice. Analysis of the juice gave the following values: moisture, 80.9 per cent; total titratable acidity (as citric acid, W/W), 3.5; citric acid, 3.31 and malic acid (W/W), 0.18 per cent.

K.L.R.

Effect of milling on the nutritive value of jowar (*Sorghum vulgare*), by Narayana Rao, M., *et al.*, *Ann. Biochem. exptl. Med.*, 1958, **18** (1), 27.—The effect of polishing on the chemical composition and nutritive value of jowar has been studied. Polished jowar was found to contain less amounts of fibre, calcium, phosphorus, iron and thiamine than unpolished jowar.

Both *ad lib* feeding and paired feeding experiments showed that a poor vegetarian diet based on unpolished jowar promoted significantly higher growth in rats than a similar diet based on polished jowar.

Rats fed on unpolished jowar diet retained significantly larger amounts of nitrogen and phosphorus than those fed on polished jowar diet.

Fortification of passion fruit squash with L-ascorbic acid, by Pruthi, J. S. and Lal, G., *Indian Food Packer*, 1958, 12 (6), 9.—The present study pertains to the effect of fortification of squash with l-ascorbic acid at different levels (50, 100 and 150 mg/100 g.) on its colour, flavour and ascorbic acid retention during processing and three years' storage at three temperatures.

During processing, there were negligible changes in ascorbic acid, carotene, pH, Brix and colour of the various packs except in the pasteurized squash where the losses in ascorbic acid were of the order of 2.5 per cent. Storage temperature was the most important factor governing the retention of ascorbic acid. Irrespective of the level of fortification, the per cent retention of ascorbic acid during a storage period of about one year under different treatments varied from 11.0 to 13.7 per cent at 37°C, 68.0 to 72.0 per cent at room temperature and 90.3 to 93.5 per cent at 5-7°C.

Colour deterioration as measured in a photoelectric colorimeter, was found to be maximum at 37°C and minimum at 5-7°C. The colour absorption was maximum at about 420 $m\mu$. The optical density at 420 $m\mu$ increased from the initial figures of 0.187-0.198 to 0.730-1.080 at 37°C, 0.308-0.424 at room temperature and 0.194 to 0.224 at 5-7°C after 3 years' storage. Further at high storage temperatures, darkening was progressively greater with increasing levels of fortification with ascorbic acid. Deaeration did not exert any significant influence in retarding the colour changes. Darkening was decidedly greater in the pasteurized squash than in the [illegible] lots. Browning was comparatively less in the canned product than in the corresponding bottled sets. The role of ascorbic acid in darkening of squash and the results of the organoleptic evaluation have been presented and discussed. The squash irrespective of the level of fortification, had a normal shelf life of about a year at ordinary temperatures. To enhance its nutritional value, the fortification of squash with ascorbic acid may be desirable.

PART II (Indian)

ANALYTICAL

Analysis of fat soluble synthetic colours by reversed phase paper chromatography, by Roy, B. R. and Sundararajan, A.R., *J. & Proc. Inst. Chem.*, 1958, **30**, 157.—A method comprising of reversed phase partition chromatography with filter paper discs has been worked out. Filter paper impregnated with different proportions of medicinal liquid paraffin has been used as the chromatogram and aqueous ethyl alcohol of different concentrations as developer. Movement of a few fat soluble synthetic dyes has been examined and their R_F values calculated. A few mixed colours investigated yielded separation of the individual constituents.

This method may be useful for detecting, identifying and estimating fat soluble colours in food stuffs.

A combination of wool-dyeing and chromatographic methods for detection of coal-tar dyes in foodstuffs, by Mitra, S. N. and Chatterjee, R. K., *J. & Proc. Inst. Chem.*, 1958, **30**, 161.—For the detection of coal tar dyes in food by paper chromatography, extraction of dye or dyes is best effected by wool-dyeing method. Strips of pure degreased wool should be dyed in the coloured solution on water bath, the pH of the solution being lowered gradually to get the optimum pH for the particular dye or dyes. The presence of any basic dye is ascertained first and also any vegetable dye, if present, is removed by an 'acid wash'. The extracted colour solution is concentrated and subjected to both column and paper chromatography, procedures for which are given in detail. Approximately semi-normal hydrochloric acid serves as the eluant in column and the organic water saturated phase of a mixture of isobutanol: ethanol: water (4:1:4) serves as the solvent in paper chromatography. Confirmation of a dye is made by paper chromatography where 3 spots, one of the sample, another of the control and the rest of a mixture of equal amounts of the former two, are run simultaneously. A completely identical chromatogram, both in position and hue, also corroborated, if possible, by similar colour change in altered pH confirms the dye. In case of mixture of dyes, a preparative survey is made to ascertain an approximate proportion of the constituent dyes. A control mixture is made accordingly in about the same proportion and again, as before, 3 spots (control, sample, mixture) are run simultaneously. Thus a confirmation of the dyes *without separation* is made. The following 16 water soluble synthetic food colours (of them 6 are permitted in India) have been studied, separated and identified by the present method. Brilliant Black BN, Tartrazine, Sunset Yellow F.C.F., Carmoisine, Ponceau 4R, Indigotine, Naphthol-yellow S, Red 10B, Azo Geranine, Ponceau 3R, Metanil yellow, Orange I, Amaranth, Brilliant Blue F.C.F., Wool Greens and Erythrosin. While following the method, as the analyst should have his own chromatogram of the control dyes, stress is given to rather the order of position and separation of the individual dyes and not to their absolute R_F values.

The column chromatography also offers a possibility of quantitative estimation of the dye without having to employ special costly apparatus like absorptiometers, spectrophotometers, etc. If a weighed amount of the foodstuff is treated for the column chromatography, the different fractions separated and collected could be made up to a definite volume and compared with known concentrations of the pure dye-solution. However, in such measurement it must be remembered that some dyes are apt to be destroyed more or less on storage and the amount measured in this way may not always be the true amount originally present. The chance of underestimation is there in such cases.

BIOCHEMISTRY AND NUTRITION

Protein metabolism in scorbutic monkeys, by Rohatgi, K. S., Roy, H. and Banerjee, S., *Indian J. med. Res.*, 1958, **46** (5), 661.—Blood levels and urinary excretions of non-protein N, urea N, amino-acid N d creatinine and urinary excre- ns of ammonia N, uric acid and eatine were determined in *rhesus* ionkeys during the development scurvy. After the withdrawal f ascorbic acid for $3\frac{1}{2}$ months hen the animals become severely corbutic, blood levels of non-pro- ein N, urea N and creatinine in- reased and increased amounts of on-protein N, urea N and amino- cid.N were eliminated in the urine. reatine was absent in normal urine out appeared when the animals leveloped scurvy.

Protein contents of liver of normal nd scorbutic monkeys were esti- nated. Protein content of livers of corbutic monkeys was less than ormal.

Urinary excretions of total tyrosyl lerivatives, ketoacids, homogentisic icid, tyrosine and phenylalanine vere estimated in *rhesus* monkeys luring the development of scurvy oth before and after a load dose of yrosine and phenylalanine. Scorbutic monkeys eliminated increased amounts of total tyrosyl derivatives, ketoacids, homogentisic acid, and tyrosine and these excretions were further enhanced when they were fed tyrosine or phenylalanine.

Total tyrosyl derivatives of liver, kidney, muscle, stomach, small intestine and adrenals of normal and scorbutic animals were estimated. Liver, kidney, muscle and small intestine of scorbutic monkeys contained more tyrosyls. Probably these tissues could not oxidise tyrosine efficiently, in ascorbic-acid deficiency.

Observations on the binding of vitamin B_{12} by rat serum protein fractions, by Mulgaonkar, A. G. and Sreenivasan, A., *Indian J. med., Res.* 1958, **46** (5), 690.—Vitamin B_{12} in normal rat sera samples ranges from 322 to 736 (mean value 496) $m\mu g$. per c.c. of serum. The vitamin exists chiefly bound to $\propto_2$ -globulin. More vitamin is usually assayable in the electrophoretically separated serum protein fractions than in whole serum.

With the addition of 1.5 $m\mu g$., or more of vitamin B_{12} to 1 c.c. serum *in vitro*, to mean concentration of the bound vitamin increases from about 0.4 $m\mu g$. to a maximum of about 0.8 $m\mu g$. per c.c. of serum.

With increasing additions of the vitamin to serum, up to 1.5 $m\mu g$./c.c., the vitamin is recovered in the $\propto_2$ -and β-globulin fractions.

There is observed a close parallelism between the concentration of the bound vitamin in whole serum and in the $\propto_2$- globulin and between free vitamin concentration and the β-globulin bound vitamin. No further increment in the concentrations of the vitamin in these fractions is observable when 2.0 $m\mu g$. of the vitamin is added.

With large additions of vitamin to serum *in vitro*, there is a rapid increase in the vitamin concentration of the Y-globulin fraction. It is shown that the vitamin is not in combination with Y-globulin and that it exists in a truly free state.

It is suggested that vitamin B_{12} entering circulation is immediately bound by $\propto_2$- globulin and is further transported by β-globulin to its functional sites.

Proliferation of chick embryonic heart fibroblast in various media, by Gothoskar, B. P., Ratnam, S. and Ramakrishnan, C. V., *Indian J. med. Res.*, 1958, **46** (5), 699.—Experiments carried out on the proliferation of the chick embryonic heart tissues grown *in vitro* in various media show that the tissues proliferate better in M 150 medium devoid of glutanine when judged by the survival time, increase in tissue protein, etc. The sugar uptake by the proliferating tissue also varies with the medium, suggesting a relation between tissue proliferation, sugar uptake and the nature of the medium.

Studies on pyridine nucleotide metabolism. Part I. The effect of protein and choline deficiencies on the breakdown and synthesis of D.P.N. in the rat liver, by Tulpule, P. G., *Indian J. med. Res.*, 1958, **46** (5), 706.—Metabolic changes in the livers of young albino rats fed protein and/or choline deficient diets have been studied at weekly intervals for a period of four weeks.

Changes in the composition of the liver in protein deficiency were observed between seven to fifteen days. Total nitrogen content of the liver was found to decrease with the corresponding increase in the C.F.A. Superimposed deficiency of choline on protein deficiency aggravated these biochemical changes.

In protein deficiency, total D.P.N content of the liver showed a considerable reduction in two weeks. Oxidised D.P.N. suffered a greater loss and hence the ratio of D.P.N.: D.P.N.H. was disturbed. In combined protein and choline deficiency both D.P.N. and D.P.N.H. were reduced to the same extent and the ratio of D.P.N:D.P.N.H. was disturbed. In combined protein and choline deficiency, both D.P.N. and D.P.N.H. were reduced to the same extent and the ratio of D.P.N: D.P.N.H. was unaffected.

In choline deficiency alone, an increased level of D.P.N.H. in the liver was responsible for the decreased D.P.N:D.P.N.H. ratio and an increased activity of total D.P.N.

Decreased D.P.N. activity of the liver in protein deficiency was not due to an incrase in the breakdown of liver D.P.N. but due to a reduced capacity of the liver to synthesize it under conditions of deficiency.

Studies on pyridine nucleotide metabolism. Part II. The effect of protein and choline deficiency on some D.P.N. requiring oxidative enzymes in liver, by Tulpule, P. G., *Indian J. med. Res.*, 1958, **46** (5), 718.—Two selected enzyme systems, *viz.*, malic oxidase and D.P.N.H.-cytochrome *c* reductase were studied in rats fed diets known to produce abnormal changes in D.P.N. and D.P.N.H. of the liver, to determine whether these changes could be associated with specific changes in enzymes requiring D.P.N.

Oxidation of malate *in vitro* was markedly decreased in the absence of D.P.N. Addition of D.P.N. to liver enzyme preparation of choline deficient rats suggested that the relative proportions of D.P.N. and D.P.N.H. in liver influenced the equilibrium of the enzyme reaction.

The observations on malic oxidase and D.P.N.H.-cytochrome *c*-reductase showed that in protein deficiency the apo-enzymes of certain groups of respiratory enzymes are adversely affected in addition to the changes occurring in the co-enzyme concentration.

DAIRY

Chemical composition of Egyptian kishk, by El-Sadek, G. M., *et al.*, *Indian J. Dairy Sci.*, 1958, **11** (2), 67.—Kishk samples were obtained from different localities of southern provinces of Egypt, where it is widely made and analysed. The average per cent composition of Kishk was found to be as follows: moisture 7.95; fat 6.86; ash 6.40; NaCl 4.81; titratable acidity (per cent lactic) 1.85; protein 13.43; total N 2.10; and soluble N 0.434.

The average niacin content of Kishk was 3.69 and 3.35 mg per cent by turbidity and acidity measurements respectively whilst the corresponding riboflavin content was 0.26 and 0.28 mg. per cent respectively.

A modified Teichert method for fat in cheese, by Falkenhahn, W. V., *Indian J. Dairy Sci.*, 1958, **11** (2), 76.—A modification of the Teichert method for the routine determination of fat in cheese is described. The modified test employs 70 per cent Teichert dried milk butyrometers and permits utilization of serial pipetting units and of electric rotatory shakers. Weighing and transfer of the sample into the butyrometers is facilitated by means of a tared weighing boat and a wide-mouth funnel. The danger of high fat readings through excessive amyl ester and ether formation is practically eliminated through flash heating to 81°C at the beginning of the digestion. The heat shock developed is controlled by using sulphuric acid of specific gravity 1.820. Special 50 per cent (0.06 per cent subdivided) Teichert cheese butyrometers are envisaged for the test.

MICROBIOLOGY

Metabolism of sucrose by Leishmania donovani, by Chatterjee, A. N. and Ghosh, J. J., *Ann. Biochem. exptl. Med.*, 1958, **18** (3), 69.—A sucrose-splitting enzyme has been detected in the crude cell-free extracts of *L. donovani*.

Unlike yeast or mould enzymes, this protozoal enzyme has been shown to be purely hydrolytic in nature, splitting sucrose into a mixture of free glucose and free fructose.

The various properties of this enzyme, namely pH optima, Km value, temperature of inactivation, cofactor requirement, etc. have been studied.

A possible mechanism of sucrose breakdown by the cell-free extracts of *L. donovani* has been outlined in the discussion.

Antibacterial properties of berbamine, by Lahiri, S. C. and Sen, K. N., *Ann. Biochem. exptl. Med.*, 1958, **18** (3), 95.—Berbamine hydrochloride was tested against 9 species of micro-organisms employing dilution and disc methods.

A minimum inhibitory concentration of 500 μg./c.c. or less was found for the following organisms: *Micrococcus pyogenes* var. *aureus; Escherichia coli V. cholerae* (Ogawa); *Strep. viridans* and *Strep. B-haemolyticus.*

The disc method of assay also revealed inhibitory activity against the above organisms as well as against *Corynebacterium diphtheriae.*

The antibacterial properties of this substance do not appear sufficiently strong, compared to its other potent pharmacologial properties, to warrant its use against bacterial infections. However, if the compound, or some analogue of it, is later developed as neuromuscular relaxant or for hypotensive therapy by a parenteral route, its antibacterial activity may have some practical bearing on the mainten of sterile solutions of the drug.

An investigation into the ro of betel leaf in transmission disease, by Mohan Rangam, and Bhagwat, R. R., *Indian med. Sci.*, 1958, **12** (10), 802.—Th bacterial flora in fifty betel leave and an equal number of prepare 'pans' obtained from [illegible] sources has been surveyed.

No pathogens were isolated in th entire series. Betel leaf washing yielded the maximum number o organisms, betel juice the minim and 'pan' more than the juice.

The absence of pathogens and th scanty growth of even the non-pathogens have been explained o the basis of (*a*) Antagonism of *P aeruginosa* to other bacteria and (the high acidity of betel juice.

OILS AND FATS

Refining of cottonseed oil, by anon., *Res. & Ind.*, 1958, **3** (10 261.—The dark colour of cottonseed oil is due to the presence of gossypol and related pigments which are not completely removed by the conventional caustic refining treatment. For this reason, the oil does not find much use as an edible oi and in the manufacture of soap. Of the 1.7 million tons of cottonseed produced in India annually, only 6 per cent is crushed for oil. With the expansion of the vanaspati industry envisaged in the Second Five Year Plan, there is scope for utilizing at least half a million tons of cottonseed oil annually, provided a suitable refining process is available.

This paper describes a simple and inexpensive method for the refining of cottonseed oil employing a solution of borax. The method has been worked out on a pilot plant scale (capacity 100-120 lb. oil).

The advantages of the new process over the conventional caustic refining process are: (1) Gossypol and other colouring matters are completely removed (2) the requirement of caustic soda is reduced by 50 per cent; (3) refining losses are only 6 per cent as compared to 11 per ent in the caustic soda treatment; 4) the soap stock obtained is superor in colour; and (5) gossypol and llied pigments can be recovered nd commercially utilized.

Studies in the autoxidation of hee (butterfat). Part III. Effect f metallic catalysts on the evoution of water and carbon dixide during the autoxidation of sample of cow ghee, by achha, S. M. *et al.*, *Indian J. Dairy Sci.*, 1958, **11** (2), 91.—Copper and Fe catalyse the autoxidation process. Larger quantities f O_2 were absorbed by the sample in their presence. Copper was more active in this respect.

Most of the extra O_2 absorbed by he sample in presence of the metals was eliminated as water and CO_2.

Copper favoured water formation, while Fe favoured CO_2 formation.

Studies on the keeping quality of ghee. Part I. Influence of common flavouring materials, by Soundararajan, *Indian J. Dairy Sci.*, 1958, **11** (2), 96.—Samples of ghee were prepared by using cow butter from the College Dairy and indigenous flavouring materials like curry leaf (*Murraya koenigi*), *moringa* leaf (*Moringa oleifera*), betel leaf (*Piper betel*) and lime juice at the rates that are commonly adopted in South India. A treatment with citric acid was also included, and all the samples were stored at 37° C. The physical characteristics and the chemical constants were also determined during the course of storage and the following conclusions were drawn.

Curry leaf had definite antioxidant properties and at 0.5 per cent of the weight of ghee imparted a very high keeping quality together with an agreeable aroma when added towards the close of melting of butter. The resulting sample had a low peroxide value right through the storage period and its carotene content underwent the least amount of destruction.

Contrary to popular impression, *moringa* leaf did not impart a high keeping quality to ghee.

Betel leaf at 0.2 per cent, lime juice at 0.12 per cent and citric acid at 0.06 per cent were not of much use in preventing oxidative changes.

Initial aroma was found to be of no criterion of keeping quality of the sample.

Among the various chemical constants, only peroxide value appeared to indicate correctly the degree of deterioration of the sample.

TEA

Plywood adhesives and caffeine from tea waste, by Ramachandra Rao, P. and Sinha, M. P., *Res. & Ind.*, 1958, 3(9), 241.—The annual accumulation of tea waste in India is estimated at 15-20 million lb. from which could be obtained about 2 lakh lb. of caffeine and sufficient quantities of a material which could be processed into an adhesive for the production of 35-40 million sq. ft. of plywood.

A method is described in this paper for the recovery of caffeine and the preparation of adhesive from the alkaline caffeine-free extract from tea waste. Tea waste is boiled with a dilute solution of caustic soda for 2 hours and the caffeine which passes into the extract is recovered by extraction with chloroform. The caffeine-free extract is concentrated and dried, and the dry solid obtained used for the preparation of adhesive formations with formaldehyde, phenol or phenol formaldehyderesin. The formations have been found satisfactory for the manufacture of plywood. From one ton tea waste, enough adhesive can be prepared for producing 5,000 sq. ft. plywood.

Studies on the analytical variations of Indian tea, by Sen Gupta, P. N., *et al. J. and Proc. Inst. Chem.*, 1958, **30** (5), 142.—More than 400 samples of different varieties of black tea were received in the Central Food Laboratory from 60 tea estates in 7 tea producing regions of India up to February, 1957.

In the present investigation, 343 samples were analysed with the aim to determine the regional variations of the analytical values and to recommend specifications in the light of these results for refixation of the standards of purity of tea.

The ranges of the analytical values of the samples of different regions as well as the frequency distribution of the samples according to these values have been tabulated and the results have been fully discussed. These have been compared with the existing standards to show that the latter require modifications so as to assume stricter control on the sophistication of tea.

The values of different chemical constituents, which will permit 90 to 98 per cent of the samples of different regions to be declared genuine have been recommended for adoption as revised standards.

GENERAL

Plywood adhesives from tamarind seed testa, by Ramachandra Rao, P. and Rajagopalan, T. K., *Res. & Ind.*, 1958, **3** (10), 275.—About 9,000 tons of tamarind seed testa (T.S.T.), a by-product of tamarind seed kernel powder industry, are available per year and one of the uses to which it can be put is in the manufacture of plywood glues. A glue formulation prepared with the alkaline extract of T.S.T. in powder form and 25 per cent paraformaldehyde is satisfactory, but the cost is high because of the large amounts of paraformaldehyde required. A glue composition obtained by dissolving T.S.T. extract powder (100 g.) in water (400 g.) followed by trituration with paraformaldehyde (5 g.) and wood flour (5. g) has been found to give satisfactory ply boards by hot pressing at 120°C. and 300 lb./sq. in. for 12 minutes. Wood flour in the formulation can be substituted by tamarind seed kernel powder as a filler.

PART III (Foreign)

ADDITIVES

Composition of polyoxyethylene (8) Stearate, by Birkmeier, R. L. and Brandner, J. D., *J. agric. Fd. chem.*, 1958, **6** (6), 471.—The composition of polyoxyethylene (8) stearate was investigated to determine its safety as a food additive. This compound—made by reacting 7.4 moles of ethylene oxide per mole of commerical stearic acid—contains unesterified polyoxyethylene glycol and polyoxyethylene glycol monostearate, distearate in the molar proportions of 1.1 to 2.0 to 1.0, with free and esterified polyethylene glycols having equal polymer lengths. After allowance for small amounts of catalyst and water, the results are those expected if rapid ester interchange occurs. The polyglycols through the nonamer comprise 81 per cent of the total polyglycols and the polymer distribution approximates a Poisson distribution.

The effect of sodium ascorbate and sodium iso-ascorbate on the quality of frankfurters, by Mills, F., *et al.*, *Food Tech.* 1958, **12** (6), 311.—Processing time may be reduced when using sodium isoascorbate in the formulation of skinless frankfurters. A more tender, juicier product may be produced by the accelerated process if it results in a higher moisture and/or fat content in the final product. In these experiments, control frankfurters, with no ascorbate, were processed by standard procedures and the anticipated losses due to the longer processing time were compensated for in the formulation. Under these conditions there were no significant differences in tenderness and juiciness between frankfurters containing sodium isoascorbate and similar products containing no ascorbate. Frankfurters containing sodium isoascorbate or sodium ascorbate had a brighter and more desirable internal colour than controls prepared in a similar manner. The colour was uniform, and under-cured products were not found in the experimental lots.

ANALYTICAL

The microbiological determination of pantothenic acid in wheaten flour, by Clegg, K. M., *J. Sci. Food Agric.*, 1958, **9** (6), 366.—An investigation of the pantothenic acid content of a range of whole meal and lower extraction wheaten flours has been made. The vitamin was liberated by enzymic hydrolysis with intestinal phosphatase and Dowex-treated chick liver enzyme; some comparisons were made with extracts prepared by treatment with takadiastase and papain, which showed that approximately 50 per cent more pantothenic acid was liberated by the treatment with intestinal phosphatase and chick liver enzyme.

The pantothenic acid content was determined microbiologically with *L. casei* as the test organism. The values of pantothenic acid were higher for whole Manitoba wheats than for the English wheats tested; the pantothenic acid content decreased with lower extraction rates and the 70 per cent extraction flours retained approximately 50 per cent of the vitamin present in the wholemeals.

Estimation of strontium in biological materials by means of a flame spectrophotometer, by Harrison, G. E., *Nature*, 1958, **182,** 792.—The estimation of strontium based on the neutron activation analysis, although sensitive and accurate is laborious and time-consuming. The A. has described in this paper, a rapid and accurate method for the estimation of this trace element in biological materials using an S.P. 900 'Unican' flame spectrophotometer. The method consists in dry-ashing the material such as faeces, wine, cow's milk, diet, etc. overnight at 650° C., taking up the ash in $2N$ hydrochloric acid and then eliminating much of the alkali and phosphate otherwise interfere with the spec photometric estimation. The purified solution containing calcium and strontium nitrate used for spectrophotometirc sis. A known aliquot of strontium solution is mixed with nitrate extract. The two solutions directly assayed on the flame sp trometer using the strontium at 460.7 μ, a slit-width of about 0 mm and a grain setting of about Reflections on the galvonometer recorded. The strontium content the biological material is calc with the help of an equation g The results obtained by this meth compare very closely with th obtained by the neutron activatio method.

K.L.R.

Separation of glucose-1-phosphate and glocuse-6-phosphate by paper chromatography by Harrap, H. E. G., *Nature*, 1958, 182, 876.— Glucose-1-phosphate and glucose-6-phosphate are not easily separated by the usual solvent systems. The A. has developed a new method of chromatographic analysis wherein boric acid is added to saturate the solvent systems methyl cellosolve-methyl ethyl ketone-3N ammonium hydroxide (7:2:3:v/ and this helps to effect a sharp separation of glucose-6-phosphate from glucose-1-phosphate, and from other naturally phosphoric esters like fructose-1.6-diphosphate and inorganic orthophosphate. The chromatogram was run at 20° C. for 48 hours.

K.L.R.

Determination of coumarin in the presence of sterols, by Clopton, J. R., *J. agric. Fd. Ch* 1958, **6** (6), 457.—Colorimet methods for the determination of coumarin, which involve a colou reaction with diazotized p-nitroaniline, give inaccurate results when applied to sweet clover and other sterol-containing plant materi Sterols as well as several other s of compounds, give the same olour reaction as coumarin with his agent. A procedure is desribed for the quantitative removal f 'free' and 'combined' coumarin rom ground sweet clover seeds and he subsequent spectrophotometric etermination of coumarin in the xtract.

IOCHEMISTRY AND UTRITION

The proteins in water extracts f corn, by Craine, E. M. nd Fahrenholtz, K. E., *Cereal hem.*, 1958, **35** (4), 245.—The roteins in water extracts of corn orm insoluble precipitates while geing at low ionic strengths and when frozen and thawed. This nstability prevents assay of proein fractions by solubility methods. The extracts are stabilized by addiion of salt or by removal of anion ontaminants. Some of the extract proteins react with phytate ions at pHs below 5 to form insoluble omplexes. Precipitation of these complexes aids the fractionation of he proteins. Increasing the ionic strength of the extracts decreased the pH at which a particular protein phyate complex precipitates. Among six protein components identified electrophoretically, three are major portions of the protein. Each can be prepared in fairly homogeneous condition. At least one of these combines with a dialyzable anion to form a soluble complex which can be detected electrophoretically at pH 8.6. The protein composition of two different samples of corn varied, as one of the major protein components could not be detected in one sample. In purification of seed proteins, removal of phytate ions is desirable. A method for their removal from protein using highly cross-linked anion exchange resin is described. The extracts have enzymes capable of hydrolyzing the endeogenous proteins. They have optimum activity at a pH of about 4 and are inactive at pH 7 or above at low temperatures.

The inhibition of Beta-amylase by ascorbic acid, by Rowe, A. W. and Weill, C. E., *Cereal Chem.*, 1958, **35** (4), 289.—The inhibition of beta-amylase by ascorbic acid has been found to be non-competitive. This contrasts with the competitive type of inhibition caused by parachloromercuribenzoate. The nature of this inhibition and its reversal by very small amounts of cystine suggest that the ascorbic acid is acting by some mechanism other than a direct reaction with the essential sulfhydryl groups of the enzyme.

Response of rats to diets high in methionine and related compounds, by Cohen, H. P., Choitz, H. C. and Berg., C. P., *J. Nutr.*, 1958, **64** (4), 555.—The growth retardation and accelerated deposition of splenic iron noted upon adding excess methionine to a basal diet were not markedly altered by the further addition of glycocyamine to favour creatine and homocysteine production. Supplementation with glycine, and arginine, or with ethanolamine decreased the growth-retarding effect of the excess methione, but apparently not its stimulation of iron deposition. Replacement of the excess methionine by homocystine produced the same striking retardation of growth, but little or no increase in splenic iron. Methionine sulfoxide produced less growth retardation than homocystine, but was more effective in stimulating the deposition of splenic iron. Supplementation of the basal diet with cystine, a-amino-n-butyric acid, or homoserine produced little change in the rate of growth and no stimulation of iron deposition. Cystine and homocystine together suppressed the rate of growth more markedly than homocystine alone. Dimethylthetin was as effective as methionine in suppressing growth and stimulating the deposition of splenic iron. Choline and bataine alone produced moderate increments in splenic iron, but little or no growth retardation. When they were fed in diets which contained homocystine, they decreased the growth depression as effectively as glycine or serine, presumably because they may undergo conversion to glycine but feeding them jointly with homocystine did not alter markedly their capacities to promote the deposition of splenic iron. The provision of extra vitamins did not alleviate the growth suppression or the iron deposition induced by excess methionine. Paired feeding showed that the limited intake of the high methionine diets was probably largely responsible for the growth retardation, but not for the characteristic decrease in the erythrocyte count. It is tentatively assumed that the accelerating effect of methionine upon the erythrocyte turnover is associated primarily with its participation in transmethylation reactions, its growth-depressing effect primarily with the metabolism of its homocystine moiety.

Iron absorption and metabolism: III. The enhancement of iron absorption in rats by D-sorbitol, by Herndon, J. F., *et al.*, *J. Nutr.* 1958, **64** (4), 615.—D-Sorbitol is capable of enhancing significantly the absorption of iron in iron-depleted as well as in normal rats administered low levels of iron. Above a critical minimal level of D-Sorbitol, the absorption of iron is a direct function of the amount of D-sorbitol orally administered with the iron. The possible mechanisms by which sorbitol and carbohydrate derivatives affect absorption are discussed.

Influence of linoleic and linolenic acids on symptoms of vitamin E deficiency in chicks, by Dam, H. *et al.*, *Nature*, 1958, **18,** 802.—Dietary polyenoic fatty acids are known to promote exudative diathesis and encephalomalacia, the symptoms caused by vitamin E deficiency in chicks. The influence of two different polyenoic fatty acids, namely linoleic and linolenic, on the two symptoms has been studied by the AA. Chicks, which had received a commercial chicken mash low in vitamin E during the first two weeks after hatching, were fed vitamin E free basal diet containing less than 0.016 per cent polyenoic fatty acids for a period of 28 days. Ethyl esters of linoleic and linolenic acid were daily at a level of 1.5 per cent to the basal diet. The results show that exudative diathesis is produced by both the fatty acids tried while encephalomalacia occurs only with linoleic acid. Similar effect was earlier found when peanut oil treated with 'Filtrol' was used as addition to an otherwise fat-free and vitamin E-free diet. The possible mode of action of linoleic acid in producing encephalomalacia has been discussed. Addition of cholesterol to a diet producing encephalamalacia was found to decrease the incidence of encephalomalacia and favour the development of exudative diathesis.

K.L.R.

FISH

Effect of delayed handling upon shrimp quality during subsequent refrigerated storage, by Fieger, E. A., Bailey, M. E. and Novak, A. F., *Food Tech.*, 1958, **1X** (6), 297.—Evidence presented stresses need for rapid processing of freshly caught shrimp. For superior quality retention during ice storage, shrimp should be removed from trash fish and headed within an hour or as soon as possible after being caught. This treatment should result in removal of sand veins, high in bacteria, and may retard melanosis appreciably during ice storage. Adequate washing after heading should also contribute a beneficial effect on the ice storage life of the product.

FRUIT AND VEGETABLE PRODUCTS

Application of peroxidase test paper in food processing, by Morris, H. J., *Food Tech.*, 1958, **12** (6), 265.—The value of a test paper for measuring the peroxidase activity of blanched vegetables has been appraised. Results given by the test paper are compared with results of the Masure and Cambell qualitative and quantitative method. The test papers offer food processors a convenient means of evaluating peroxidase activity of food samples.

INSECTICIDES

Colorimetric determination of residual perchloroethylene in fumigated wheat, by Brumbaugh, J. H. and Stallard, D. E., *J. agric. Fd. Chem.*, 1958, **6** (6), 465.—The use of tetrachloroethylene in fumigants to control insect infestation in grains makes it necessary to determine the residual amount of this compound present after fumigation. A simple, sensitive colorimetric method for determining small amounts of perchloroethylene in wheat—utilizing a new-found colour reaction of perchloroethylene with pyridine, aniline, and sodium methylate—is presented.

Determination of allethrin residues in milk and meats, by McClellan, D. B. and Moore, J. B., *J. agric. Fd. chem.*, 1958, **6** (6), 463.—A method accurate to 0.1 p.p.m. is presented to determine allethrin in the milk or meat tissues of domestic farm animals, which have been subjected to a concentrated allethrin spray. The determination involves solvent extraction of the tissues, concentration, and reaction with highly acidic mercuric oxide-sulfuric acid reagent to produce a red colour. The colour developed follows Beer's law and can be measured colorimetrically. Allethrin was not found in the milk of dairy cows which had been sprayed daily for 3 weeks, or in the meat tissues of a female goat that had been sprayed daily for 5 weeks—all with a large overdose of the spray.

Fumigation of agricultural products: XVI—Some aspects of the fumigation of imported potatoes in boxes with methyl bromide for the control of tuber moth *Gnorimoschema operculella* **(Zell.),** by Lubatti, O. F. and Bunday, G., *J. Sci., Food Agric.*, 1958, **9** (6), 360.—As the phytotoxic action of methyl bromide on potato tubers is small at the dosages which are lethal to all stages of the tuber moth, fumigation of potatoes this insect is possible. Deter tion of residual fumigant, both and fixed, and palatability show that fumigation at the d required is safe.

Penetration of methyl brom vapour in the boxes can be hanced by taking advantage of 'Turtle Effect'.

A provisional assessment malathion for stored-produc insect control, by Parkin, E. A *J. Sci. Fd., Agric.*, 1958, **9** (6), 37 —Malathion has properties whic make it generally suitable for u for stored products, but the persistent disagreeable odour evi ent during mixing and applica is a disadvantage. Its stability heat, moisture, and alkalinity needs more detailed assessment. It h low mammalian toxicity and outstanding toxicity to *Oryzae surinamensis* and *Tribolium cast* beetles which are often n easily controlled under practical conditions by other insecticides suitable for use in food stores. It also shows promise of value for the control of several other species of stored-product insects, but *Ptinus tectus* beetles have been found to be resistant to it.

MEAT

Effect of package type, irradiation and treatment with aureomycin on redness of vacuum-packaged beef cuts, by Dean, R. W. and Ball, C. O., *J. agric. F Chem.*, 1958, **6** (6), 468.—Redness of fresh beef samples, vacuum-packaged in cans and in film packages, was measured. Samples in cans with small head space had better red colour than those in any film-type package. Of the fi materials, a coated polyethylene gave the best red-colour preservation. Aureomycin treatment samples prior to packaging was detrimental to red-colour retention. Irradiation at a 500,000-rep. le was detrimental to the red colour samples in cans or film packages.